THE MODEL ENGINEER

Vol. 95 No. 2356 THURSDAY JULY 4 1946 6d

A ship-rigged yacht makes an unusual and picturesque sight when under way. The example seen here was built by Mr. H. A. Cox, of Fawley, Hants. Its hull is about 6 feet long, and the photograph was taken during one of the preliminary trials. The booms on the courses are seen catching the water, but a device to prevent this is being adopted

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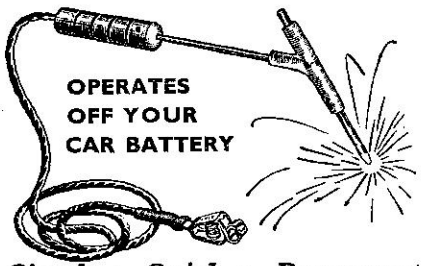

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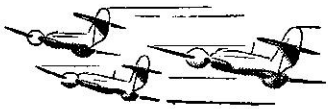

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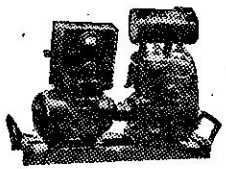

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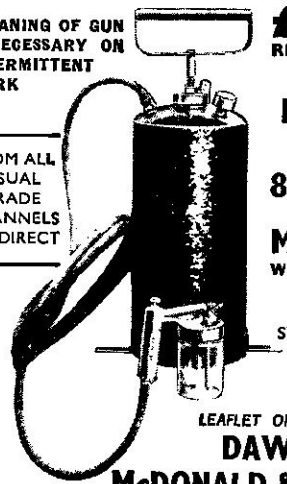

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THE

MODEL ENGINEER

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VOL. 95 No. 2356. JULY 4th, 1946

SMOKE RINGS

The Last Day for Entry Forms

HAVE you realised that the closing date for returning entry forms for the Competition Section of THE MODEL ENGINEER Exhibition is July 13th? The catalogue has to be prepared, instructions for dispatching models have to be issued to competitors, and final plans have to be made for staging the exhibits in an orderly and effective manner. All this takes time. If you wish your model or other piece of work to be included in this best-ever show do not delay in obtaining and returning your entry form. Don't forget that a special cup is offered for the best example of work by a lady competitor, and that there are numerous prizes for juniors under 16. A postcard to the Exhibition Manager, 23, Great Queen Street, London, W.C.2, will bring you a form and full particulars.

Left-handed in South Africa

THE ripple of interest set up by my recent note on left-handed mechanics has spread far afield, and I now have a letter from Mr. Harry P. Jupp, of Queenstown, C.P., in South Africa, who, I am pleased to see, signs himself "Yours Mechanically." Although Mr. Jupp adds very little that is new to the discussion, he does at least confirm that left-handers are not confined to the home country. He writes :—"Your notes in *Smoke Rings* of April 11th issue will, I have no doubt, cause as much amusement to other left-handed mechanics as it did to me. I was apprenticed to the joinery trade at the age of 14, and at my present age, 62, I still continue to use the 'wrong hand.' I am able to do a number of things with the right hand, but using a file or saw is not one of them, neither am I able to use a hammer in the right hand. I suppose there must be thousands of men in the mechanical world who are left-handed and who never feel any disability at all, still it was a curious thought of yours, and I expect brought a deal of correspondence. I operate my lathe without any feeling that I lack something being 'molly handed,' in fact, I wonder just how left-handed people would feel operating a left-hand lathe, suppose such were made. THE MODEL ENGINEER comes to us out here just when a ship arrives, very often two or three copies at a time, but they are always welcome."

You Can't Be Too Careful

HERE is a little story from friend P. W. Wilson of the U.S.A., which shows how easy it is to jump to conclusions when reading a blueprint a trifle carelessly. He says :—"A funny thing happened here quite recently, when a new three-throw crankshaft was fitted to a ship (1,800 i.h.p.). It was later found to have been built 'out of sequence'—with the L.P. crank leading instead of the H.P., whilst the keyways for the eccentrics had been cut in the shaft in reverse order to the above-mentioned 'sequence.' The owners are demanding a *new* shaft. The cause of the trouble or error was not in the drawing, but rather in *reading* the drawing. The cranks were shown 120 deg. apart, and marked 1, 2, 3, with an arrow showing the direction of rotation, with the note '*Looking from Aft.*' This was unfortunately read as '*Looking Aft.*' That little word 'from' just threw the devil's hoof into the thing and there's $7,500 involved in it! No Sir, there's always something 'new' in engineering, always something to keep one on one's toes—we are never dull, and maybe that's what keeps us going."

Calling Mr. Macey

IN connection with my "Smoke Ring" in the June 20th issue on the Romford Re-union, Mr. Markham, the Hon. Sec., would like to hear again from a visitor, Mr. Macey he thinks, who brought a 4-4-2 locomotive for a trial run, and would be glad to help him over some of the difficulties he experienced. A line to 38, Kent Drive, Hornchurch, would be welcomed.

A Pontefract Society

THERE is a proposal on foot to organise a model engineering society in Pontefract. Several local model engineers are interested in the idea, and it is felt that there are probably many lone hands in the district who would welcome the chance of meeting together. If so, would they please get into touch with Mr. John Lea, 156, Southgate, Pontefract, Yorks.

Percival Marshall

Ship Modellers' Corner

By Edward Bowness

Details for constructing and fitting the top-gallant masts for the model 4-mast barque "Archibald Russell"

THE t'gallant and royal masts are made in one piece, as on the actual ship. Three should be prepared to the dimensions given in Fig. 52, the lower end being reduced to $\frac{1}{16}$ in. diameter to fit the hole in the block which represents the trestle trees. The trucks may be formed of Seccotine or Durofix in the following manner. A pointed instrument is dipped in the adhesive and then held point downwards near the tip of the mast, when the blob of adhesive will transfer itself to the mast and, owing to surface tension, will form itself into a perfect sphere. When almost dry, a slight pressure on the top will flatten it until it forms the flattened sphere typical of the British mast truck. In U.S. ships the mast truck was practically spherical in form.

The topmast caps for holding the t'gallant masts have been described already and should now be fitted in position. The topmast cap backstays should be fitted at the same time, one on each side, being made of one cord 16 in. long and looped over the mast head before fitting the cap. On the fore and main caps an additional cord, 7 in. long, should be inserted under the cap on the after side of the mast to form the main and mizzen royal stays (52). The backstays should be secured to the eyes in the pin rail as with the previous backstays.

Before actually erecting the t'gallant masts, those who wish to do so should drill the masts for the halliards. The holes are just below the point of attachment of the stays. Similar holes should be drilled in the topmasts just below the crosstrees. But I have seen so many models with broken masts, due entirely to drilling these holes, that I prefer not to take the halliard through the mast, but to fix it in a small vertical groove on the fore and after side of the mast, making each portion separate, rather than to weaken the mast by drilling. Of course, in a larger model one need not hesitate to drill the mast; but even in a $\frac{1}{4}$-in. scale model of an East Indiaman which came into my hands recently for repairs, there was a t'gallant mast which had broken through this very cause.

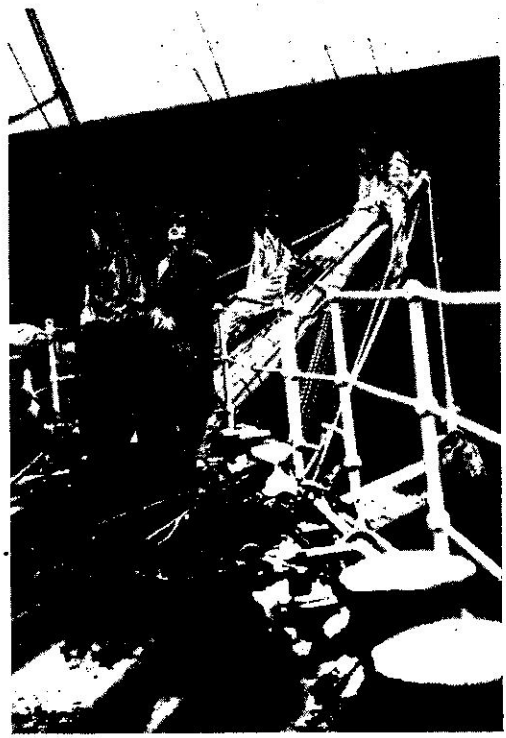


Photo by [*E. Bowness*

Bowsprit from fo'c'sle head

We can now erect the t'gallant masts, putting the base of the mast through the clip and inserting the $\frac{1}{16}$ in. diameter portion into the hole in the trestle trees. Next fit the t'gallant shrouds. There are two on each side and they are fixed on the mast at the point where the stays and backstays meet. Bring them down over the ends of the crosstrees, using a spot of Durofix at each point, and secure them to the mast band below. The t'gallant backstays should then be fitted, two on each side, then the main and t'gallant stays (51) which were left hanging loose from the lower mast caps. These should be looped around the mast, resting on the band formed by the attachment of the backstays, and, after getting sufficient tension to hold the mast firm and straight, the end should be seized to the stay on the forward side of the mast.

The foremast stays are somewhat different. The fore-topmast stay (44) is already in position. Immediately over it comes the middle jib stay (45), which is brought down and secured to the bowsprit at the clip for the bobstay. Similarly, the outer jib stay (46) is also looped around the topmast head and brought down to the bowsprit at the point indicated in Fig. 56, $\frac{13}{16}$ in. from its outer end. From this point the jib boom guys are led aft, one on each side, to be secured to the bows just under the catheads. Similar guys are led from the end of the jibboom to the ends of the catheads. These may be seen in the photograph of the bowsprit reproduced in this issue.

The royal backstays should now be fitted on the fore, main, and mizzen masts, one on each side, being made in one length 24in. long, firmly fixed around the mast at the position indicated in Fig. 52, and led down to the eyes in the pin rail, as were the others. The main and mizzen royal stays (52) which were left hanging from the fore and main topmast caps may now be fitted in the manner and with the correct tension, as already described for the t'gallant stays. In fitting the fore royal stay (48) sufficient length should be allowed to include the jibboom stay, making the cord about 16in. long. This should be pegged into the stem close below the bobstay, fixed with a turn around the end of the jibboom and taken up to the royal mast head, where it is looped around the mast and seized to give the tension necessary to secure the mast at the correct rake. Below the bowsprit the stay should be stretched over the end of the martingale and secured with a spot of Durofix.

Photo by] *"Archibald Russell" looking up main mast* *[E. Bowness*

The spreaders should now be fitted. They are made of split bamboo, 1/32 in. square by 1 in. long, and are provided with slight notches on the inner side opposite the upper backstays. They are glued on top of the crosstrees at such an angle that they just touch the backstays. If there is any slackness in the backstays, move the spreaders aft a little so that when the stays are glued into the notches the tension is increased somewhat.

The accompanying photograph, taken looking

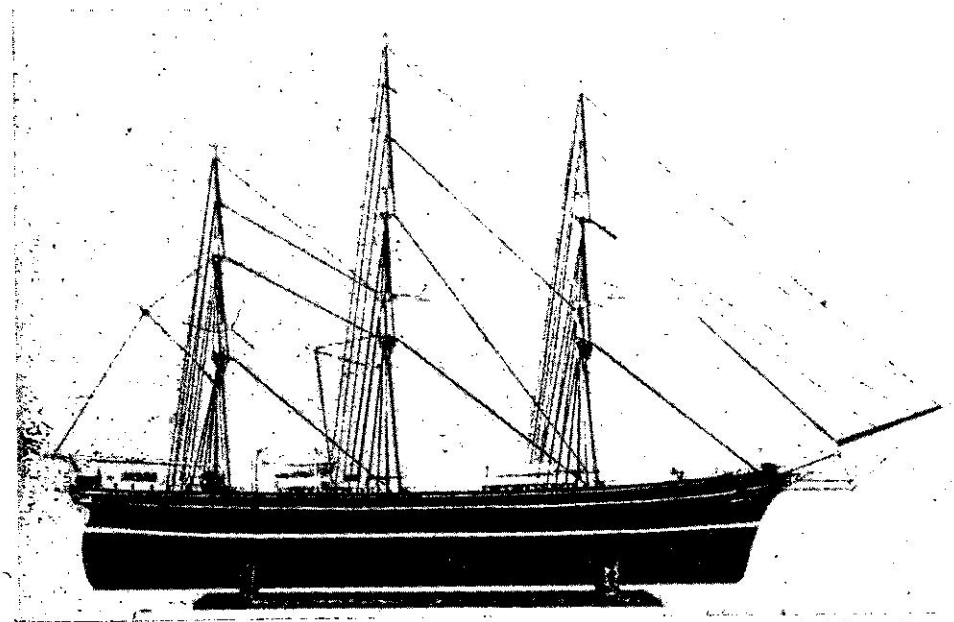


Photo by] *[Angus Bowness*

Model of "Cutty Sark," $\frac{1}{16}$ in.=1 foot, with standing rigging only

up the mast, will be of interest in this connection. The form of the mast top, the crosstrees, and the spreaders is well shown, and the backstays can be identified, first the two from the lower mast cap, then three from the topmast trestle trees, one from the topmast cap, two from the t'gallant mast, and one from the royal mast, nine in all. The curved end of the after crosstree can be seen on the starboard side. The reason for curving the ends of the crosstrees was to carry the anchorage of the shroud a little farther aft, so as to help the backstays in counteracting the forward pull of the stays.

The jigger topmast, which is in one piece from the base to the truck, should be made to the dimensions given in Fig. 52. Normally the weight of the topmast is taken by a fid through its base which rests on the trestle trees, but in a model of this size it will be simpler to reduce the base of the mast to $\frac{1}{16}$ in. diameter for a length of about 1/32 in., and to let this fit into a corresponding hole in a tiny piece of three-ply or card about 5/32 in. square, which is glued on top of the trestle trees. The mast cap is similar to the one already described for the other three topmasts, except that it carries a tiny eye made of wire instead of the yard clip used on the others.

To erect the topmast, first fit the clip in position, at the same time inserting a length of cord between it and the mast on the after side. The ends of this will be used later as the lifts for the gaff. Next put the topmast through the clip and insert the $\frac{1}{16}$ in. diameter portion in the hole provided for it. Now fit the shrouds, two on each side, in the manner already described for the topgallant shrouds on the other masts. Next in order come the backstays, two on each side. In this connection note that the aftermost backstay is secured to the aftermost or 7th eye on the poop, the t'gallant backstays being secured to the 6th, thus crossing over the topmast backstay. The topmast stay (50) is first fixed around the mizzen lower mast just below the cheeks and then taken to the topmast head where it is looped over the shrouds and backstays, the loop being seized just forward of the mast to give it the correct rake as already described. Next fit the t'gallant backstays, one on each side, and finally the t'gallant stay (51). This will be found hanging from the clip at the mizzen lower mast cap and should be looped over the backstays at the mast head and secured at the correct tension.

When describing the eyes for the backstays—see Figs. 16 and 17 in the issue for June 28th, 1945—we suggested that some builders might prefer to simplify matters by fitting six backstays instead of the nine as on the ship. In this case, one instead of two may be fitted from the lower mast head, two instead of three from the trestle trees, and one instead of two from the t'gallant mast head. This, of course, applies only to the mizzen, main and foremasts. The jigger mast has only three on each side, and this is not too complicated. The accompanying photograph of my *Cutty Sark* model shows it at the stage at which we have now arrived with our model of the *Archibald Russell*. It will be seen that the number of backstays was reduced in this model, and, in my opinion, the appearance was not adversely affected, especially when one considers the small scale. The wire clips for the lower topsail yards will be seen. There was none at the topmast caps, as the ship had single t'gans'ls. I might mention that before finishing the model I raised the peak of the spencer gaff, thus improving its appearance very considerably. The vangs for the spanker gaff were not fitted when the photograph was taken.

For the Bookshelf

Basic Mathematics for Radio Students, by F. M. Colebrook (London: Iliffe & Sons Ltd.); price 10s. 6d. net. 270 pp., size $7\frac{3}{4}$ in. × $4\frac{1}{4}$ in.

In spite of the title, the contents of this book are largely of general application and should be of use to students preparing for many other branches of engineering than radio. The first six of the seven chapters cover much fundamental groundwork in algebra, geometry, trigonometry and the calculus, most of it presented in a lucid and practical manner. The seventh chapter deals essentially with the application of mathematical ideas to radio.

Bench Work and Fitting, by W. J. Peck (London: Pitman's); price 3s. 6d. net.

We have been favoured with a copy of the second edition of this useful handbook. The author has been wise to restrict the alterations to certain additions to tables in the Appendix. The book is intended primarily for beginners in workshop processes, and it serves its purpose well.

The Duplicate Locomotives of the London and South Western Railway, published by Railway Hobbies Ltd., 86, Essex Road, Southsea, Hants; price 2s. od. net.

This is a nicely-printed list of all the locomotives which were on the duplicate list of the L.S.W.R. as at December 31st, 1922.

Particulars of types, builders' dates and numbers, as well as dates of withdrawal, are included. The illustrations consist of reproductions of nineteen splendid photographs by Mr. H. C. Casserley, who seldom fails to achieve real pictorial worth in his work. Certainly, this selection is a real joy for the enthusiastic locomotive historian.

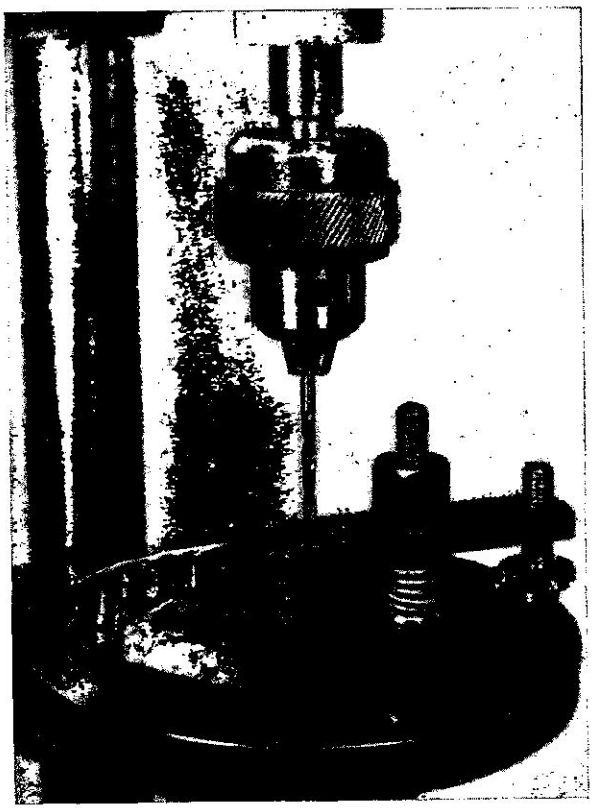
★THE "M.E." SENSITIVE
DRILLING MACHINE

Some suggestions for detail improvements in this machine, and hints on how to use it to the best advantage

by "NED"

ONE or two constructors of this machine have fitted, or contemplated fitting, ball-bearings to the jockey pulleys. There is no objection to this, but neither is there any very great practical advantage, as the plain bearings run quite freely, and last a very long time, if treated to a spot of oil occasionally. The pulleys can, of course, be fitted with renewable bushes if desired, and if this is done, the use of "Oilite" self-lubricating bushes, as employed in Mr. Wedge's machine, is recommended. Mr. Wedge states that it is important to case-harden the shaft if "Oilite" bushes are employed, but this is desirable in any case to obtain maximum length of wear.

Ball-bearings, if fitted, should be protected against the entry of dirt or swarf, which, even if it does not ruin the bearings, will almost certainly nullify any anti-frictional properties they may possess. The simplest form of ball bearing pulley would be one fitted with two single-row standard ball-races, either in carefully aligned recesses in the ends of the bore, or with a spacing bush between them. Small cup-and-cone "bicycle" type bearings may be constructed to fit the pulleys if desired. With any form of ball-bearing, it is not easy to arrange the pulley to float freely endwise, which is desirable, though not imperative, to align the belt automatically on either of the three speeds. Ball-bearings will be found somewhat noisier than well-fitted plain bearings, which may be undesirable in some cases.



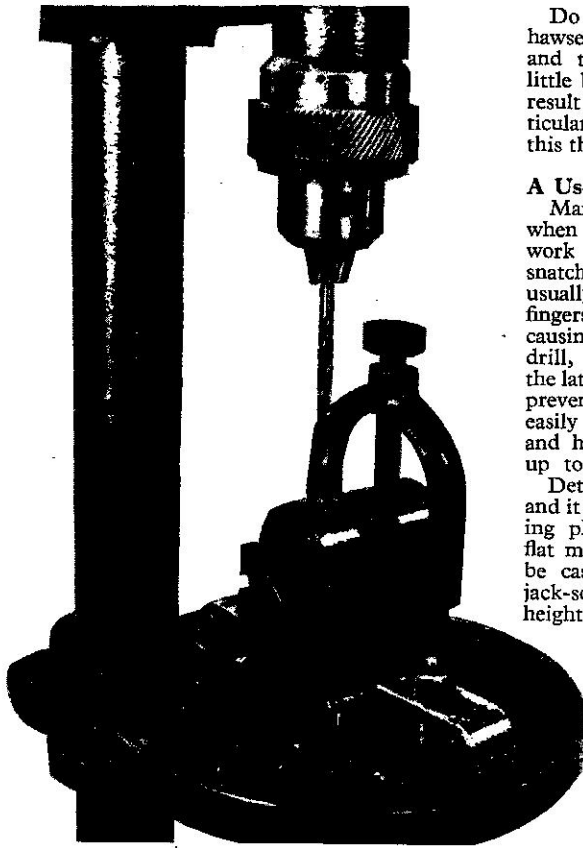
The drilling clamp in use, showing how the forked end will hold the work close up to the hole being drilled

The pulleys are shown in the drawings as having vee-grooves, similar to those of the cone pulleys, but it has been found better to make the grooves semi-circular, and to a radius as great as possible within the limit of width available. This helps to facilitate belt alignment, as the belt is not confined to a plane square with the pulley axis, but can run at its natural alignment angle. It should be noted that this applies only to guide or "jockey" pulleys; in a belt pulley designed to transmit drive, the belt should not be allowed to rest in the bottom of the groove, but should make contact with the angular sides, which not only provide much greater contact area, but also produce a wedging action to promote belt grip.

Driving Belts

While on the subject of belt drive, it may be mentioned that several types of belts have been used on this machine, and all have proved fairly

★*Continued from page* 600, "*M.E.*," *Vol.* 94, *June* 20, 1946.



Standard type vee block and straddle clamp, secured to drilling machine table by two bent clamps for diametral drilling of round bar

satisfactory. A $\frac{3}{16}$ in. round rubber belt, with the ends cut to a long scarph joint and solutioned, gave quite good service, but eventually became "perished" and brittle, possibly influenced by contact with oil. Steel spiral belting has also been used, but is liable to be noisy, and less efficient in grip than textile belts. Leather and gut belts give good results if one can overcome the fastener difficulty. The best fasteners for these belts which have been found so far are steel wire hooks, as used for sewing machine belts. The ready-made hook-and-eye fasteners are not at all suitable for small high-speed belts; they make an awful clatter as they pass over the pulleys, setting up vibration, and undue wear and tear.

Cotton rope or fabric belts are well worth consideration, but here again, joining the ends is a problem. As the belt tension can be adjusted by shifting the headstock of the machine, a permanent joint or splice is quite practicable, and may be found eventually to give the least trouble. The use of twisted insulating tape to produce an endless round belt, as described recently by Mr. K. N. Harris, is quite a good idea.

Do not use a driving belt as tight as a towing hawser, as it will cause quite unnecessary wear and tear, not to mention harsh running. A little belt slip does no harm, and even if it does result in the drill sticking when the cut is particularly heavy, it is much better for it to do this than to break or strain the drill.

A Useful Drill Clamp

Many of us have encountered minor accidents when drilling small components, due to the work not being securely held against a sudden snatch as the drill breaks through. What usually happens is that the work, held in the fingers, is wrenched from one's grip, generally causing a cut or scratch, and spins round on the drill, sometimes so much out of balance that the latter is bent or broken. This can be entirely prevented by means of a simple clamp, which is easily applied to practically any form of work, and holds it securely down to the table, close up to the drill.

Details of this clamp are shown in Fig. 6, and it is also illustrated in use, in the accompanying photograph. It is made from a piece of flat mild-steel bar, which may, with advantage, be case-hardened afterwards, and the knurled jack-screw enables it to be quickly adjusted in height to suit the work and packing. A square is formed under the head of the clamp bolt, so that it cannot turn in the slot of the table. The clamp nut is turned spherical on the lower face, to enable it to align itself if the plate should not be perfectly horizontal; note that the plate is countersunk to correspond with the nut face, and the hole should have ample clearance.

The spring and washer on the clamp bolt are not absolutely necessary, but facilitate handling, as the clamp "stays put" when released from the work, instead of flopping down in a heap, and it may be swung out away from the drill, when its use is not required, without the necessity of removing it completely from the table. Some very small components have been successfully handled by the clamp; in one case, plates only $\frac{1}{4}$-in. square were drilled with holes in each corner without the slightest difficulty.

A small machine-vice is, of course, also very useful as a drilling-machine accessory. The smallest size in the Jones and Shipman range is suitable, also the corresponding "Yankee" vice; the machine-vice supplied as an accessory to the Myford lathes is a little larger, but still extremely useful, and may be made even more so by the fitting of hardened jaws.

Diametral Drilling

The difficulty of drilling a hole exactly through the diameter of a round rod, as required when fitting a cross-pin, is often encountered by model engineers. Whether a vice or a vee-block is employed to hold the rod, it is by no means easy to be quite sure that the drill passes exactly through the centre, and it is by no means uncommon for a drill started at "12 o'clock" to

come out at "five" or "seven" instead of "six," as intended! Several forms of drill jigs and other devices have been designed to deal with this problem, but while these are quite sound for a particular production job, they are liable to be cumbersome for general work.

The photograph shows how a standard form of vee-block, with or without a means of clamping the work, may be mounted on the table to ensure that it is properly aligned with the drill spindle. It is rather curious that although many operators are particular about clamping the work to the vee-block, it does not occur to them that the location and fixing of the latter is still more important.

In the example shown, the vee-block is held down by two small bent clamps, fitted with bolts, which pass through opposite slots of the table. It is most important that the groove of the vee-block should be centred accurately under the drill spindle, and the best way to ensure this is to use a piece of rod, with an accurate point, in the drill chuck as a location gauge. When the vee-block has been clamped in position, the work should be laid in the groove, and allowed to take up its own alignment until the drill has properly started, after which it may be held with the clamp of the vee-block if desired. With sharp drills, run at the proper speed, and not forced in feeding, true diametral drilling is ensured by adopting this method.

Drill Lubrication

It is often desirable to lubricate the drill, especially when carrying out deep drilling in steel, but the usual method of applying the lubricant (or coolant), with a brush is not convenient when both hands are fully occupied. Drip cans are not often seen fitted to drilling machines, but there is much to be said in favour of them, though the usual method of adjusting the feed may be more trouble than it is worth for short drilling jobs, and possibly accounts for their lack of popularity.

The method used for feeding the lubricant on the writer's machine may be of interest. An old sight-feed drip lubricator—acquired for a mere song at the club jumble sale—is attached, by means of an arm and a split clamp, to the pillar of the machine, and fitted with a drip pipe which may be swung into position close to the drill when required. As most readers are aware, the old-fashioned sight-feed lubricators, which were almost universally fitted to steam and gas engines, were equipped with an ingenious adjustment to the needle valve, which enabled it to be kept set for a given rate of flow, and at the same time used as a cut-off valve. This arrangement is most convenient for the present purpose, as it avoids the need for any fiddling with adjustment, and the feed can be instantly stopped when drilling is completed.

Drill Chucks

No definite specification or recommendation as regards the type of drill chuck to be fitted to this machine, is laid down in the design, though the chuck shown in the drawing is one of the screwed-spindle type as commonly fitted to ordinary hand braces. Such chucks vary greatly in quality, but the better class examples are fairly accurate, and give good service. If the constructor of the machine wishes to economise to the utmost in his outlay, he may be quite satisfied to fit one of these chucks, but the machine is worth fitting with a better type of chuck, and the one recommended is the No. O Jacobs or Almond type (0-¼ in.). This chuck has a taper socket at the back, and is best fitted by turning the end of the drill spindle to fit this really accurately. A form of chuck which is not recommended is the two-jaw type, having interacting vee-jaws operated by a right- and left-handed screw, as this is very liable to damage drill shanks, and may permanently corrugate the smaller ones.

A few general recommendations for drill users may be helpful; even though they may be ancient history to most readers with mechanical training, one often finds that familiarity breeds contempt, and the most obvious common-sense rules are honoured more by the breach than the observance.

Always run drills at as near the correct speed as possible, and neither force nor restrain the feed; let the drill feed at its natural rate, which can be found by the "feel" of the feed lever. Back the drill out frequently to clear the chips; do not wait until it shows signs of binding before

(*Continued on page* 11)

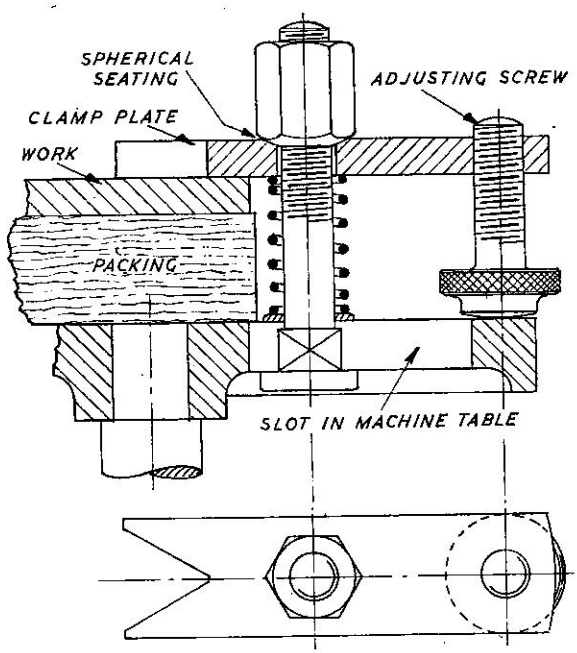


Fig. 6. Details of simple drilling clamp (full size)

"L.B.S.C."

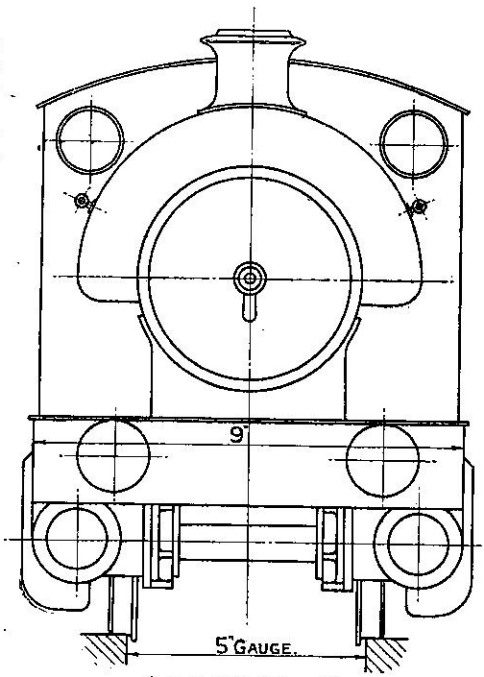
5-in. GAUGE FOUR-WHEELERS

IN direct contrast to the raw recruits who have fallen for the "Lassie" and started to build her, some followers of these notes, both experienced and novices, have lately been asking for a few notes on a simple type of four-wheeled shunting tank for 5-in. gauge. They prefer the wider gauge, as being safer to ride on, especially for kiddies; and as a normal goods or passenger engine in this gauge is a "bit of a handful," both to build and operate, a little engine is called for. It can take sharp curves, and should be easy and cheap to build; suggestions have been made that stock 3½-in. gauge castings and material might be utilised. With these arguments your humble servant fully agrees, so let's have a few words on the subject.

Most of the full-sized locomotive-building firms specialising in small industrial locomotives, such as Bagnall's, Peckett's, Hunslet, Fowler, Hudswell-Clarke and so on, have a range of standard designs to suit varying gauges from 2 ft. upwards; and any prospective builder who fancies any particular outline, would probably find something suitable in their catalogues. At the same time, if exact outline is of no moment, and all that is needed is an engine that looks like and performs as such, it is an easy matter to build up from available material.

A Proposed Design

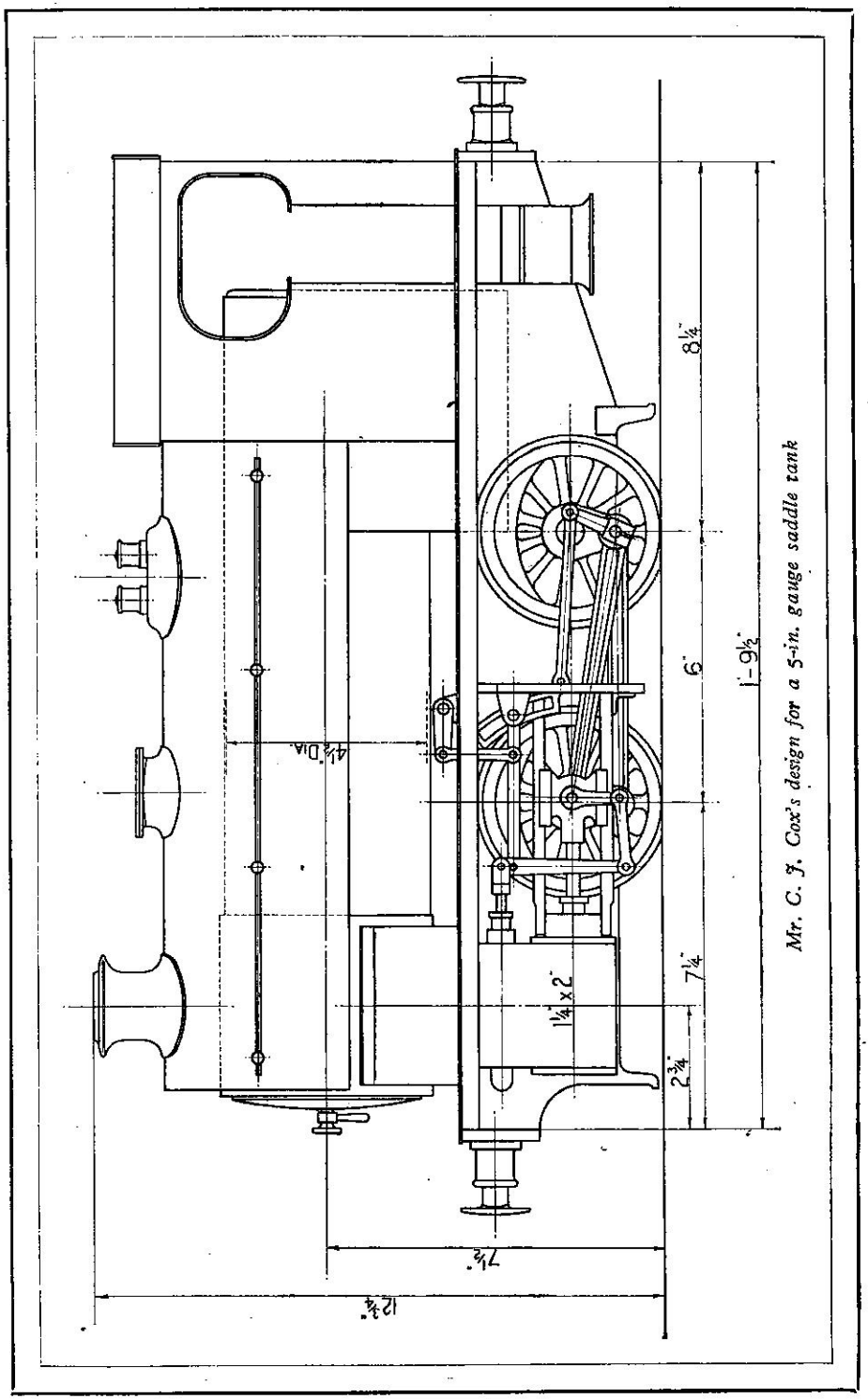
Several prospective 5-in. gauge builders have sent along particulars of their own designs for comment and criticism; and to pull somebody else's whistle-cord (for a change, says you!) about the most symmetrical, yet easy-to-build proposal that has so far come to hand, is that submitted by a Dudley reader, Mr. C. J. Cox. Our worthy friend's drawing, reproduced here, shows a sturdy and compact little locomotive which is virtually a small edition of a standard-gauge industrial four-wheeled saddle-tank, as used around docks, factories, and other plants where the curves are of very small radius. The frames are practically all straight lines, very easy to cut out, and ⅛-in. steel plate would be quite stiff enough. The ordinary type of horns and axleboxes are used; as the wheels are small, the springs could be in pockets drilled in the axleboxes, and bear against the tops of the hornblock openings, in a similar manner to those I have described for low-wheeled 2½-in. gaugers. The wheels are 4 in. diameter on tread, mounted on ¾-in. axles.



A real little "pug"!

Cylinders and Motion

The cylinders are 1½-in. bore and 2-in. stroke, which would be about "scale" size for this class of engine; but anybody who did not want to make patterns, and utilise stock castings as used for normal-sized 3½-in. gauge jobs, could use "Lassie" cylinders, which would give plenty of power for hauling half-a-dozen passengers at least. If the demand arose, doubtless the good folk who supply "Lassie" castings would produce cylinders of the size first mentioned. The ports would be exactly the same as specified for "Lassie," ditto the slide-valves. The ordinary type of double guide-bars are shown, with the usual "alligator" crosshead; and the Walschaerts valve gear is the "simplest ever." The guide-yokes could be cut from ⅛-in. steel plate, and the brackets for the link attached to the front; these could be made from pieces of angle, suitably bushed. Mr. Cox's drawing shows a single link, which needs a trunnion-block on each side of it, giving clearance for the forked end of the radius-rod, which is lifted and lowered by a drop-link from an overhead reverse shaft. If absolute simplicity is desired, the single-sided arrangement which I specified for "Dyak" (2½-in. gauge) and "Princess Marina" (3½-in. gauge) could be substituted, the radius-rod being extended past the link, slotted, and lifted and lowered by the lifting-arms direct, as on the "Lassie." In that case the link bearing should be about ⅜ in. long and ⅛ in. diameter, and the link itself about ¼ in. wide. Combination-levers, union-links and crosshead-arms could be arranged as on the "Lassie"; and a "pole" lever used for reversing, placed in the cab alongside the boiler.



Mr. C. J. Cox's design for a 5-in. gauge saddle tank

Mr. Cox suggests a boiler with a barrel 4½ in. diameter, containing twenty ⅜-in. tubes and two ¾-in. superheater-flues; but as a result of my experiments with high superheat, I should increase the flues to four in number, and reduce the tubes accordingly. The inside firebox would be 3 in. wide and 4½ in. long, and our friend is rather dubious about this being sufficient. He need have no fears on that score; in fact, he wouldn't, if he had built a "Rainhill" and seen how her tiny boiler steams. Provided that the smokebox is airtight, and the blast nozzle and blower jets properly lined up with the chimney, the suggested boiler would have no difficulty in keeping up steam As to boiler feeds, a pump could be fitted between the two axles, pointing forward, and driven by an eccentric on the leading axle. An injector could also be fitted at the side of the frame close to the back step, or above the running-board just ahead of the cab, as desired. To prevent the water in the saddle-tank cooling the boiler, and itself becoming too hot to be fed by the injector, a good thickness of felt lagging should be placed in between the boiler and the tank.

Personally, I prefer a side-tank engine to a saddle-tank; and this one could be made as a side-tank engine quite easily, the boiler being pitched about 1 in. higher, and provided with a dome. The side-tanks could extend almost to the smokebox, and also form the lower part of the cabside, as on the old L.N.W.R. side-tank engines, being cross-connected by a ⅜-in. pipe under the boiler barrel; this would give greater water capacity, and there would be no fear of the water becoming too hot for the injector to operate. This would also give another 1 in. depth of firebox.

Superstructure

As regards "top works and trimmings," the whole lot could be made from sheet brass 18- or 20-gauge. If a saddle-tank is used, tubes would have to be run through it for chimney and safety-valves, but as there is no pressure to withstand, and very little heat, soldered joints would be quite satisfactory, reinforced with riveted angle in such places as the corners of the cab. Sheet steel of 16-gauge would do for running-boards. For convenience in driving, the back part of the cab, and half the roof, could be made removable, similar to my L.N.W.R. tank engine "Olga." Small locomotives look awful running with *all* the roof missing; but when only half is *non est*, the appearance isn't bad at all, as many of the older engines had only short cab roofs. One mistake that old "Bro. Francis of Crewe" made with *all* his engines, not only the compounds, was letting rainwater run down his drivers' necks! What some of the enginemen said about it, after coming through a storm, with a cross wind to help matters along a bit, would have not only boiled the water, but superheated the steam as well. However, Mr. Geo. Whale soon put that right when he took the reins, extending the cab roofs of his new engines right back over the footplate. Yet, such is the perversity of human nature, that when big overall cabs were first introduced on the earlier engines, the drivers would have none of them, preferring "open-air treatment"; a hardy lot were the "boys of the old brigade." It was the later generation that reaped the benefit.

Well, I think that about covers all the points in Mr. Cox's design; the only criticism I have to offer—and it is only a minor one—is that the very short wheelbase would make the engine an active member of the "Tailwaggers' Club." Unless she is destined for a road with hairpin bends, the wheelbase could be lengthened an inch or so with advantage, shifting the rear axle under the firebox and bringing the overhang at each end to equal measurements. The front end of the ashpan could be made to slope down over the axle, as there is plenty of width between the inner faces of the horns to allow this to be done.

"Hielan' Lassie"

Valve Gear Variations

No alterations are necessary to the actual valve-gears as given in the previous instalments, for use with piston-valve cylinders; the variations are in the connections and the valve-setting. As piston-valves with inside admission move in the opposite direction to a slide-valve in relation to the piston, the connections at the top of the combination-lever are reversed; that is, the radius-rod is coupled up to the top hole in the combination-lever, and the valve-spindle to the hole below it. The distance between the piston-rod and valve-spindle centres is less in the case of the piston-valve cylinders than the slide-valve type; and this, plus an ordinary straight valve fork or crosshead, in place of the knee-jointed one, will bring the outside valve-gear into alignment without any alteration to the location of the link-bracket or any other bearing. As the location of the inside gear was arranged to suit an ordinary straight valve fork instead of the knee-jointed one, reversing the combination-lever connections will bring the link trunnion $\frac{5}{16}$ in. below the position in which it would give the absolute best steam distribution. Followers of our old friend Inspector Meticulous can, if they so desire, set the brackets carrying the link $\frac{5}{16}$ in. higher, cutting the fixed bracket off a cast motion-plate, and substituting a new one made from sheet metal or angle, and attached by screws, and also setting the reverse-shaft brackets at the same height to suit. Alternatively, the link-bearings and reverse-shaft can be left as they are, and the eccentric-rod lengthened slightly, so that the link swings more to one side than the other, thus counteracting the slightly oblique drive. To get the correct length, simply proceed as before described; set the link so that the radius-rod can move from top to bottom without shifting the valve-spindle, and take the distance from the centre of the hole in the tail, to the bottom of the groove in the eccentric, with the crank on dead centre. Add half the diameter of the eccentric, and the result is the length of the eccentric-rod, from the centre of the strap to the centre of the eye at the end of the rod.

Note—very important this—with inside-admission valves, the return cranks and the inside

eccentric should *follow* the main cranks instead of leading them; otherwise the engine will go the opposite way to the lever, the top half of the link operating the go-ahead motion. This is sometimes arranged intentionally; for example, on the Maunsell 2-6-0's of the Southern Railway, the reverse shaft is above the links, with the reverse arms pointing to the rear of the engine, and connected to the radius-rods behind the links. When the screw reverser in the cab is in the forward position, the reverse arm on the shaft is also pushed forward, raising the ends of the lifting-arms, and lifting the dieblocks to the tops of the links. The return cranks are therefore set to lead the main cranks, and utilise the top half of the link for going ahead. The American-built "Austerity" 2-8-0's (the "Doughgirls") have the same arrangement for the same reason. Designers weren't so particular in days gone by, and many locomotives had the valve-gear set so that the engine went the opposite way to the lever. This made it a bit awkward for some of the drivers who had a different engine every day; and more than one mishap occurred through the lack of uniformity. One such case occurred on the Midland when a train stopped for a signal in a thick fog. On getting the right-away, the driver put his engine into what he thought was full forward gear, opened the regulator, and in the fog didn't realise he was going backwards until his train crashed into the one following. Anybody who has ever been on an engine in bad fog can realise how easily the mistake was made. Sometimes a reversing-gear has been put up wrongly by error; for instance, a new fitter at West Croydon shed, when re-erecting the valve-gear of one of the "E" class tanks, coupled up the back gear eccentric-rods to the tops of the links, and the forward gear rods to the bottom. The error was not noticed until the driver pulled his lever back to go out of the shed, and the engine promptly went forward when the regulator was opened, making a sorry mess of the shed wall.

When making the combination-levers for inside-admission gear, drill all holes No. 32, and ream the lower hole $\frac{1}{8}$ in. When erecting, put the radius-rod at the top, and drive the silver-steel pin through; the bolt which passes through the valve-fork, also passes through the combination lever below the radius-rod. The valves are not set by sight, but under pressure. As already mentioned, drain-cocks or relief-valves are a necessity with piston-valve cylinders; open these, and apply air pressure by means of a tyre pump and temporary rubber connection to the steam inlet on the valve-chamber. Turn the wheels by hand, with the lever in either forward or back gear. Exactly as the crank reaches each dead centre, the air should "siss" like a soda-water syphon in action, from the drain cock. If it doesn't, and "sisses" early at one end and late at the other, merely adjust the valve on the spindle, until the desired result is obtained.

The "M.E." Sensitive Drilling Machine

(*Continued from page 7*)

backing out. The extra cost of the best quality drills is well repaid by extra length of service, and more efficient cutting at the highest speed of rotation, which is always conducive to accuracy. Always make sure that the drill point runs truly before attempting to start a hole. If accuracy of location is highly important, it is good practice to use a small, short drill to "spot" the centre of a hole before using the correct size drill.

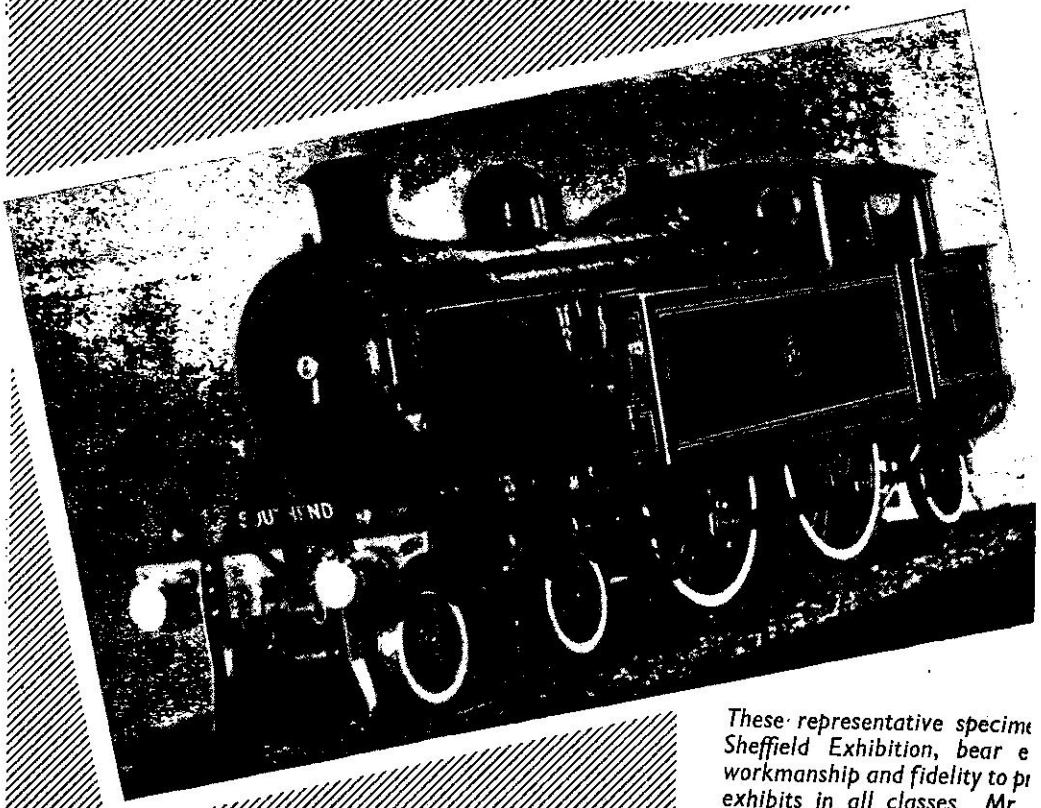
Never, under any circumstances, drill holes which can possibly pass right through the work without using some form of packing between the work and the table. If blind holes are being drilled, set the height of the table, or the drill stop, to limit the feed of the spindle to the required amount, so that there is no risk of the drill breaking through by accident. The deplorable effects of neglecting this elementary rule are only too often seen in unsightly drill-pits in the table of a drilling machine—one of the surest testimonials of slovenly mechanics! Hardwood packing is satisfactory for most purposes, but should not be kept in use after the surface has been impaired by numerous drill holes. Metal packing is better when the utmost accuracy is required, but should always be kept free from burrs and other inaccuracies.

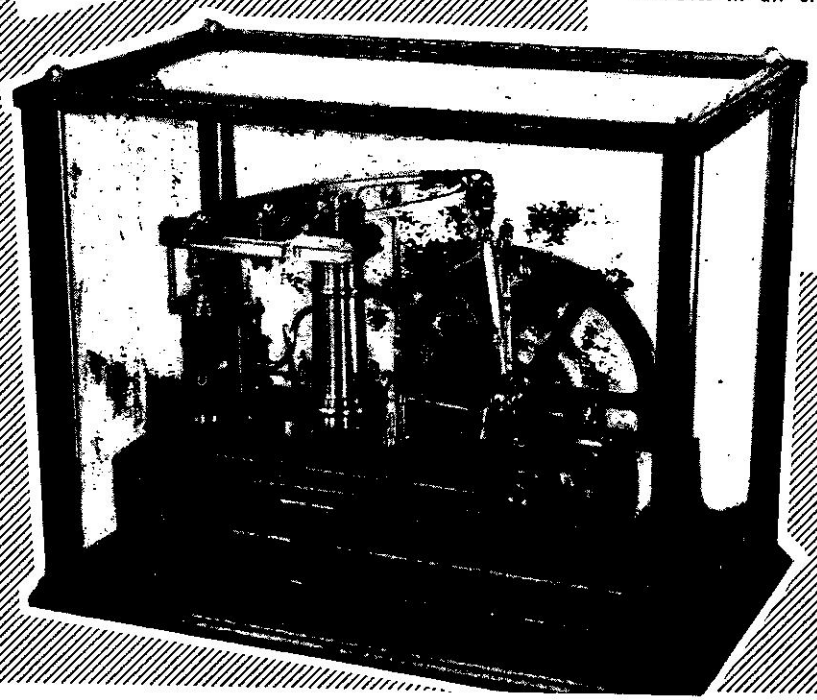
Don't tolerate blunt drills, which are sure to cause inaccuracy, apart from other troubles. Small drills are often difficult to grind properly, but may be touched up with a small carborundum slip if only slightly dull. It is better to throw away a drill than to keep it in use after its efficient life is finished.

Don't leave the key in the drill chuck—operators have been known to lose an eye through starting up a drill with the key in the chuck. The best way to park the chuck key is to attach it to a length of chain anchored to the machine, so that it cannot be mislaid.

Small drilling machines are often fitted too low for convenient operation. The normal height of the drill table, for operating in a standing position, should on no account be lower than that of the top surface of a bench vice, and may, for specially small work, be as high as chest level. Bending the head forward over the drill table often results in getting one's hair caught in the machine—a mishap which is always painful, if nothing worse. This is, of course, a good argument for fitting a guard over the front of the spindle.

The drilling machine, though one of the simplest machine tools used in engineering, demands just the same care as other machines, and there is plenty of scope for skill and initiative in using it to the best advantage.





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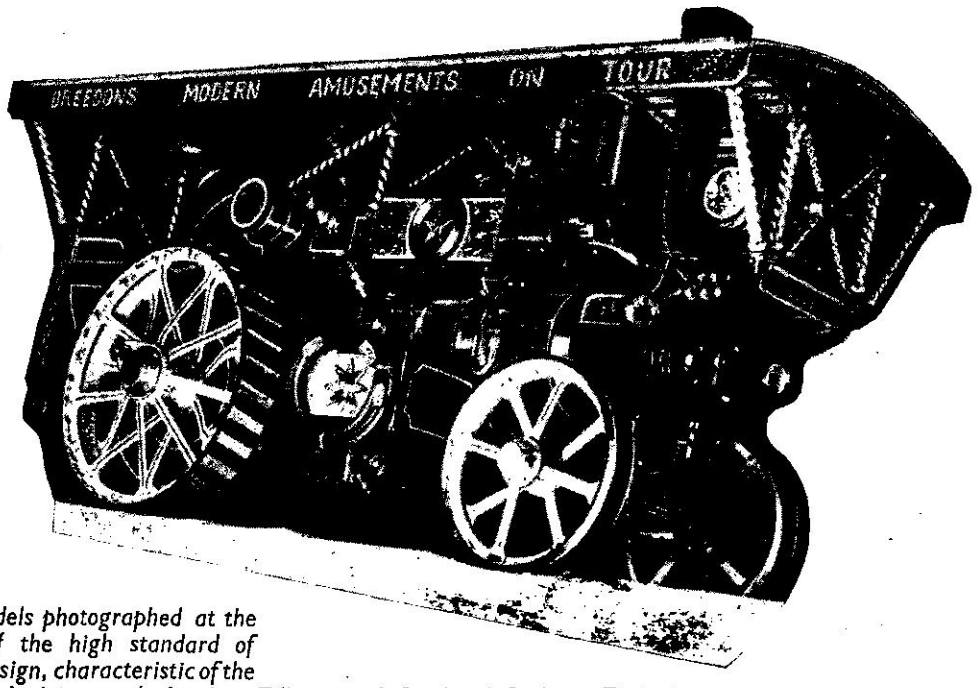
SHEFFIELD EXHIBITION



s of models photographed at the dence of the high standard of otype design, characteristic of the . Skinner's 1 in. scale London, Tilbury and Southend Railway Tank Locomotive (top left) is an xample of scale modelling, complete down to details such as the oil reservoir and pipes, and the t seen in front of smokebox. The Beam Engine by Mr. R. A. Barker (bottom left), which won in the Stationary Engine class, was shown working at a dignified slow speed under compressed air. work was also apparent in Mr. S. Breedon's $1\frac{1}{4}$ in. scale Showman's Compound Road Locomotive another first prize winner in its class. Mr. N. E. Nicholson's $3\frac{1}{2}$-in. gauge "Princess Royal" comotive (bottom right), assessed by the judges as the finest model in the exhibition.

FACTORY METHODS
in the Home Workshop

By "1121"

THE model engineer is frequently averse to any suggestion which savours of "mass production" methods. Mass-production, he says, is an evil of this wicked machine age. It destroys the craftsman and the old pride of workmanship. It makes the man the servant of his machine, and eventually makes a machine out of the man himself. The amateur craftsman who works for the enjoyment of working has no need of this striving after time-saving and efficiency. He is not working to a schedule. Whether his model takes him six months or six years to build makes no difference to his enjoyment in building it.

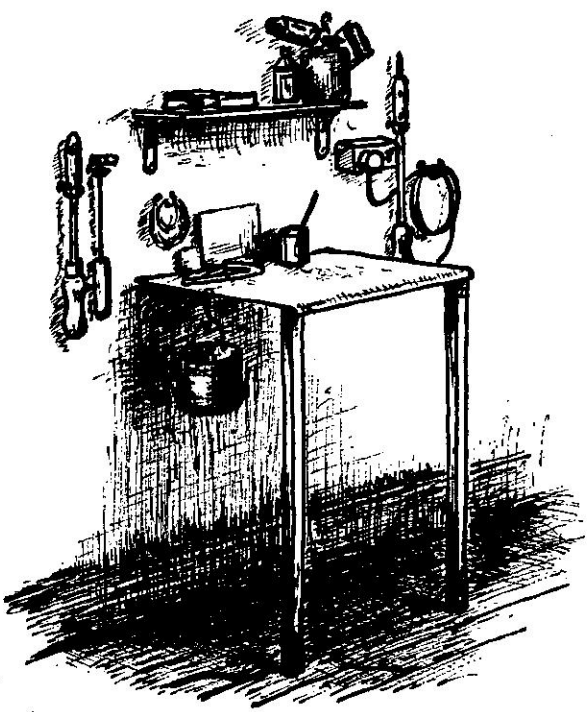
To all this the writer agrees up to a point, but would like to make the suggestion that elimination of time *wasted* in doing the more tedious jobs that are bound to crop up will enable the model maker to get on to something more interesting, and thus increase his enjoyment of the job as a whole.

And what about all those little domestic jobs that periodically find their way into the workshop, invariably just as one is preparing for an interesting evening's work on the model in hand? Is it not agreeable to be able expeditiously to dispatch the repaired article back to the kitchen, thus leaving the rest of the evening free for more interesting pursuits, earning sorely-needed approbation from the domestic authorities and producing a sense of pride in the workshop? For there is as much satisfaction to be obtained from a workshop that runs well as from a model that runs well.

For the moment it is not proposed to describe a lot of elaborate equipment which would take longer to make than the average model, but it is suggested that a few very elementary principles may be applied in the first place, at the expenditure of very little work in re-arrangement of the workshop installation, which will pay for itself many times in saving of *wasted* time and reduction of fatigue. Notice in every case the stress laid on the expression *wasted* time. The writer is not concerned with merely saving time taken to produce a model—time spent agreeably cannot be time wasted. His object is to reduce time spent in unproductive drudgery, for which there can be no excuse.

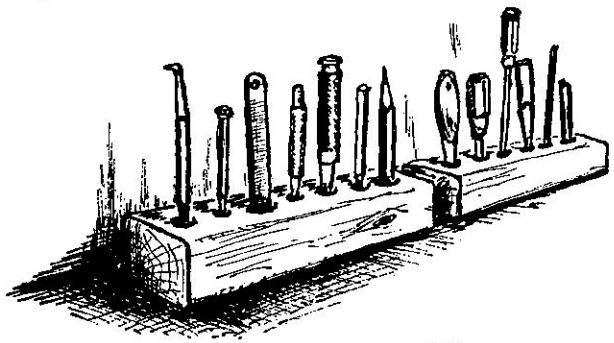
The desirability of this attitude has been brought home forcibly to the writer during the war by virtue of the restriction of available time resulting from wartime conditions. In this respect he has been more fortunate than many people, who have had to cease activity altogether, but, nevertheless, the abnormal calls upon his time by intensive Home Guard duties, the necessity for energetic cultivation of a large garden for vegetable production, and sundry other duties, made it plain that a certain amount of organisation in the workshop was not only highly desirable, but definitely essential if there were to be anything at all to show for the few hours available for workshop activities.

Furthermore, there was another and most important factor which entered into the state of affairs. A number of the writer's friends being desirous of doing a spot of model work occasionally, and having no workshops of their own, it was only natural that they should be invited to use what workshop facilities were available in the district. No steps were taken to form an official model engineering society. In fact, the idea was not even suggested, as it was realised that the circumstances would disappear with the end of evacuation arrangements, but the idea was very similar in spirit. On certain evenings each week two or three people would be busily engaged on their respective jobs, or possibly helping each other if they felt more like it. Any-



"Heat treatment department"

body having some tools or equipment not possessed by the writer would bring them along and add them to the common pool. The arrangement worked perfectly, but it was very soon discovered that a haphazard picking up and putting down of tools was not good enough if we were to avoid spending half our valuable time looking all round the shop for a centre-punch or pair of pliers. With one occupant only it is not so bad. The writer had brought his workshop arrangements to such a



"A series of wooden stands"

state of perfection that he knew, when he put something down on one end of the bench, precisely what would fall off at the other ; but with two or more an enormous amount of time can be wasted walking around with the rule in one's hand looking for the scriber, while somebody else is walking around with the scriber, looking for the rule.

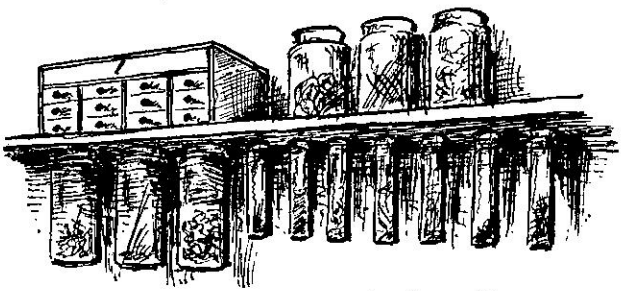
The first thing, therefore, was to knock up a series of wooden stands, which stood along the back of the bench in easy reach of the vice. They were merely short lengths of about 2 in. square that we happened to have by us, with a row of holes into which were poked the scriber, a small rule, sundry small screwdrivers, centre-punches, nail-punch, etc. ; in fact, all the items which were most frequently used in normal bench work. Above these, on the wall, hung all the pliers, pincers, wire-cutters, etc., in a row, and also such items as the toolmakers' clamps, squares, etc., and hacksaws of various sizes.

Immediately to the right of the vice, at the extreme end of the bench, were a couple of long, shallow trays, one containing hammers and the larger screwdrivers, and the other containing all the files, including the small Swiss variety which lived together in a metal pencil-box. A shallow cigarette-tin housed odds and ends such as tweezers, primus prickers, a pencil, and so on.

By this means all the tools most frequently in demand were ready to hand, and the habit was soon acquired of popping everything back in its place instead of just laying it down on the bench. No more trouble, but if the next person to require the article in question happened to be someone else he did not have to waste time searching around among a jumble of odds and ends when the item might not be there at all. The writer is not in favour of making a bench look as if no work is ever done on it ; the bench has specific uses, like any other piece of workshop equipment, and one of its uses is for putting tools on. If everything is religiously put away out of sight when it is not actually in use, more time will be wasted in opening and shutting drawers and being tidy than is saved by tidiness. The object of these notes is to endeavour to arrive at a *common-sense* attitude towards workshop organisation : the happy medium between the wasteful chaos of the entirely unorganised workshop and the highly specialised efficiency-study of the factory production line.

Although, as has been explained, these first beginnings of organisation were inaugurated principally to enable two or three people to work together efficiently, the writer when working alone soon found the advantages of the habits formed while working with the others, and was encouraged to extend the system to other aspects of the workshop activities. It was agreed next that the arrangements for soldering, silver-soldering, and any other processes involving the use of heat, water, acids, etc., could be improved upon. It was decided to abolish the old method, under which the blowlamp was deposited on the bench, filled and pumped up (we had no gas), to the accompaniment of obnoxious odours of methylated spirit and paraffin, and even more obnoxious language from some unfortunate person who had chanced to make contact with one of the more heated parts of the paraphernalia.

It was noticed that a neighbour had put out as salvage an ancient kitchen oven, and one dark night a shelf was purloined from this and set up as a " heat-treatment department." It was dirty and rusty, but quite strong, and was attached to the wall at the back and supported by a couple of wooden legs at the front. The wall at this point happened already to be faced with a sheet of metal as protection, and to this ready-made Hades was consigned any incendiary-minded member of the fraternity, where he could do no harm to anybody. A series of hooks supported the blowlamp, soldering irons, tongs, etc., not forgetting an old distemper-tin (with handle) full of water, hung in a convenient position for



"A desirable space-saving feature"

quenching, and the borax, soldering flux, etc., lived on a small shelf above. An electric-light socket was installed close by, into which could be plugged the electric soldering-iron. Two tins at the back housed solder and silver-solder.

The next department to receive attention was what we were pleased to call the machine-shop. This consisted, in the main, of a 4-in. round-bed Drummond lathe (treadle), and a little sensitive drill, mounted on its own stand, also with treadle drive.

It occurred to us that we were doing an enormous amount of walking about in order to do the simplest jobs on the lathe or drill. The writer has since seen shops which gave the impression that the owner was more concerned with getting his fat down than with getting any constructive work done.

The principle that we applied consisted of the placing of the accessories normally used with each machine in handy proximity to the machine itself. Between the two machines we placed a set of shelves, which carried the equipment most usually used on each machine, at the end nearest to that machine. Thus, up near the lathe were the centres, tailstock chuck, die-holder, taps and dies, lathe tools, milling-cutters and so on, with chucks, face-plates, angle-plates, etc., on a lower shelf, and heavier stuff still, such as the steady, at the bottom. At the drilling-machine end of the shelves were the vee-blocks, parallel strips, pieces of wood and other oddments most likely to be wanted there, while in between, and within easy reach of either machine, was the stuff common to both, such as drills and machine-vices. It we had had other machines, such as another lathe or a miller, or a larger range of accessories, these would have been worked into the scheme in the same way. The "machine shop" was located a sufficient distance from the bench to keep people out of each other's way, but not so remote as to make it awkward to reach any of the equipment which might at times be required on the bench, such as drills, taps and dies, vee-blocks, etc.

All this may seem very elementary and obvious when set down in general terms, but in many workshops some items of equipment are situated an unreasonable distance from the place where they are most often used, merely because they have always been there and it has not occurred to the owner that they might be more conveniently placed. Perhaps at some time in the remote past the lathe was moved to a position where the light was better, or where there was more room to get long bars into the headstock, and it was not realised that the lathe accessories could with advantage be moved also.

Situated on a third wall, and therefore between the bench and the machines, were chests of drawers containing tools less frequently used, such as woodworking tools, spare hacksaw blades, and the more delicate equipment such as micrometers, surface gauges, etc., when not in use, as well as the stock of sheet and bar material, and a drawer full of all the oddments that get saved up in case they might come in for something later on. The writer rarely throws anything away; it is surprising what queer things are sometimes just what one wants in order to save a lot of work in making some awkward component.

This brings us to a further point. So far, tools only have been dealt with, but equal importance should be attached to materials, small parts such as screws, nuts, rivets, etc., and larger parts such as castings, blanks, electrical fittings, and so on.

A series of tins, of all shapes and sizes, is all very well, but a more convenient system is one which allows the stock to be seen and examined without having to hunt out the right tin and pour its contents on to the bench in order to scratch around to find the part required. The writer procured a number of small glass sweet-bottles, about ⅞ in. diameter, by 4 or 5 in. long, with screw metal caps. These were arranged along the wall over the bench, and contained small screws, in different varieties, i.e. countersunk, roundhead, cheesehead, and hexagon; small wood screws, countersunk and roundhead; washers, rivets, split-pins, nuts, small coil springs, etc.

The same method can be adopted for storing larger parts, by using jam-jars, or better still, the type of jar that has a screw-on metal lid. The lids can be attached to the underside of a shelf, so that the jars can be screwed up into them with one hand. This utilises the underside of any shelf of which the top is already in use—a desirable space-saving feature in a small shop.

It is recommended that each classification of the parts most frequently required should be subdivided as far as the number of jars available will allow. Thus, if the model maker's speciality is locomotive building, his odds and ends would be classified "boiler fittings," "pump parts," "buffers and couplings," "brake parts," etc., while the fittings connected with his other interests would be lumped together under more general headings. The extent to which this subdivision is taken depends on the intensity of the work done. In a commercial shop engaged in turning out locomotives as a full-time occupation it would be worth while to isolate each individual component, and even subdivide further into different types of the same component. It is then easy to keep a check on available stocks of standard parts.

An advantage of the visual system against the method of using labelled-up boxes is apparent when the stock of a particular part suddenly increases, possibly through dismantling a scrapped model, or a lucky bid in a jumble sale. The tin-box enthusiast has to scrounge around for a bigger box, label it up and re-label the original one for some other use. The glass receptacle user duplicates the particular bottle involved and shifts the others up one to make room.

At this stage in the development of the writer's workshop it had to be dismantled and packed up for moving. At the moment the writer is without a home of his own, and so it is still packed up. Arrangements have been made, however, to share in the equipping of a brand-new workshop, whose owner has a certain amount of equipment, but happens to be short of just the items possessed by the writer. It is hoped, therefore, that a composite workshop will soon be in operation. As working conditions will be very similar to those in the shop described in this article, it is intended to make full use of the lessons already learned, when equipping the new shop.

A ¾-in. Scale Electric Locomotive

The Story of a Jekyll and Hyde Engine

By C. R. FOX

IN view of the current topics concerning the electrification of passenger-hauling locomotives, and in response to many requests for an account of my early activities in that direction, it seemed to me that a few notes on the subject might be of interest to the fraternity in general.

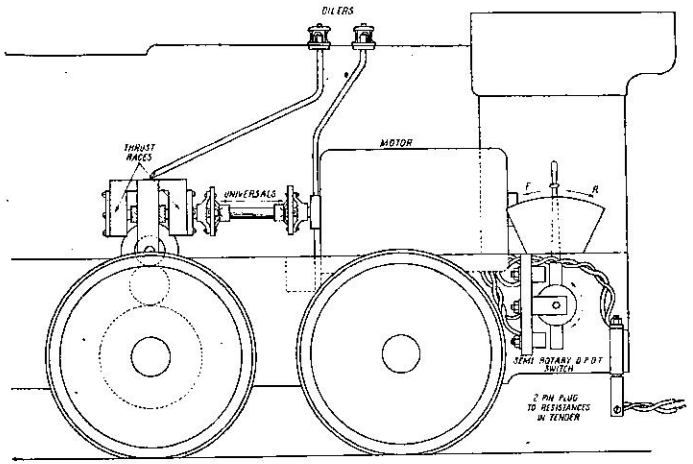
It was at one of those very popular exhibitions which were held in the good old days at the Horticultural Hall that the bug had its first bite. A friend and myself were admiring the many beautifully finished models, when my eyes lit on the Locomotive Section, and a burning desire to possess one of these beauties was mine in less time than it takes to write it. A few discreet enquiries as to the way in which one should commence to build such a model were made, and, needless to say, reams of (what appeared to me at that time) highly technical and involved information was enthusiastically forthcoming. The net result was that hope died in the manly breast, and the matter was shelved for twelve months. At the next exhibition the flame was kindled once more, and a firm resolve was made to do or die in the attempt.

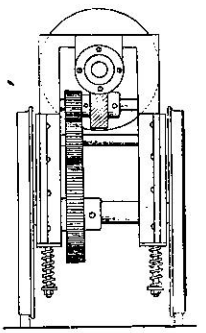
A Compromise

The prospect of a real "live steamer" still seemed beyond my scope, so I decided to compromise by building an electrically-propelled scale outline in 3½-in. gauge. I might add that I was the recipient of a good deal of chaff, and was forced to take cover behind the naperies of my then small son, and was at great pains to explain that by the time the model was completed he would still be of sufficiently tender years to render driving a lethal "live steamer" impracticable. The Southern Railway "Lord Nelson" was ultimately chosen as the prototype, frame and outline drawings, wheel castings, and one or two tools were procured and work was commenced, only to find that the most essential part of a locomotive builder's tool kit is his lathe. The acquisition of this and the "know how," the mass production of small parts to produce one satisfactory specimen, and general trials and tribulations would, if translated into type, fill a volume.

Getting a Move On !

By this time work was at a stage when consideration of power plant, track, and means of making the whole bag of tricks move was of paramount importance. Firstly, it was decided that low voltage was essential from the safety point of view. This involved two difficulties—(*a*) to select a low voltage motor with reasonably low current consumption, small bulk and high starting torque, and (*b*) the means by which to convey the current to the motor without a third rail and its involved feeders or boosters to compensate for current drop on an indefinite length of track. Both problems, however, were solved fairly easily. I was very fortunate to procure a motor which formed part of a blower unit in one of those car horns which sound like a cavalry charge when the button is pressed. On examination this was found to resemble a miniature car starter motor with fairly heavy windings, and when subjected to a brake load test running at 1,400 r.p.m. on 6 volts, a reading of





approximately 20 amps. was recorded. When this was offered up on the frames it fitted very snugly under the firebox cleading. The transmission from the motor was through the usual propeller shaft, with miniature laminated rubber universal joints at either end, thence to a right-angle skew gear drive. This was found essential in order to avoid a braking action when the current was switched off, as with a worm drive it would obviously lock solidly on the over run.

The centre driving wheels, gear train, skew gears and respective bearings were arranged in one movable unit so as to permit springing to be applied to all coupled wheels, the vertical movement being taken care of by the little universal joints in the propeller shaft from the motor, which was fixed securely to the frames. The reversing lever was housed in the cab, and resembled the usual quadrant fitting with the exception that it had only three notches in it, forward, neutral and reverse. This arm extended through the floor of the cab and operated a simple double-pole, double-throw switch of fairly meaty proportions, which merely changed the relative positions of the brush gear on the motor.

A Track Test

The frames, bogies, drivers, coupling-rods, con.-rods, and a complete set of moving dummy Walschaerts valve gear, not forgetting the cylinders, were all in position, and it seemed proper that a track test of some sort was called for at this stage. To an onlooker this must have been a baffling manifestation. Firstly, a number of planks were laid on the ground, on which lengths of ¼-in. square steel were secured at the appropriate gauge. The chassis was laid on the rails, coupled to the draw beam of which was a normal baby's pram, whose wheels nicely spanned the planking which acted as a rough guide. To the undercarriage of this a car accumulator was firmly tied and two wires connected to the motor. The main ballast came last of all. This consisted of a primitive 8-wheel bogie truck made from another short length of plank, on the underside of which a pair of roller skates were nailed, and on this a willing, but unsuspecting, neighbour was persuaded to balance himself. All things being set and a word of caution given to old faithful at the rear, the reversing lever was pushed to the forward position, and to my delight the strange collection started to move off at an ever increasing speed, terminated only just in time to prevent a pile up in the rockery, by the prompt use of an emergency brake gear in the form of a hefty pair of wire cutters.

Rapid Progress

After this, things progressed rapidly; a tender was built which housed the starting series resistances operated by a small wheel which protruded through the top of the tender in the position usually occupied by the hand pump. The accumulator was placed at the rear end of the passenger truck, and was provided with a little cover to represent a small box van. To prolong running time, a 12-volt accumulator was used, the centre busbar disconnected and the two 6-volt units connected in parallel. This gave an effective running time of approximately four hours, after which the battery was reconnected in series and charged in the usual manner. The speed of the complete train, with about six kiddies riding behind, was roughly judged to be in the region of 5 to 6 m.p.h. The maximum load the engine would pull without slip was just a little over a quarter of a ton, including battery. This condition did not last, however, as my track eventually did its best to emulate the old Waterloo Bridge.

Simple and Safe System

From the foregoing description it may be judged how simple and safe was our humble system, a fact borne out by the many young visitors who frequented our garden in the summer months, and rendered the more enjoyable for them by the elimination of adult supervision. Such a tranquil state of affairs was destined not to last, however. I first noticed a fluttering in the nest when I joined the Model Engineering Society in our district. Naturally, enquiries were made regarding my locomotive, and I was prevailed upon to take it up to their track, which I did in due course, accompanied by my lad. Comments were kindly and well meant, and to sum them all up in a few words—"Why! oh why! did you go to all the trouble to copy the outline, motion details, and so on, and then propel the model by electricity?" The son and heir, I might add, was now fully converted to "live steam," and quietly but firmly suggested that we should retire gracefully and put plans into operation for building a similar locomotive in the approved "Words and Music" style. We approached our newsagent and became regular readers of THE MODEL ENGINEER, and my confidence knew no bounds. Alas, more "Niggers in the woodpile," the only castings which I was able to obtain were the cylinders; at that time the foundries were unable to furnish wheels, etc., due to war demands.

A Rebuild

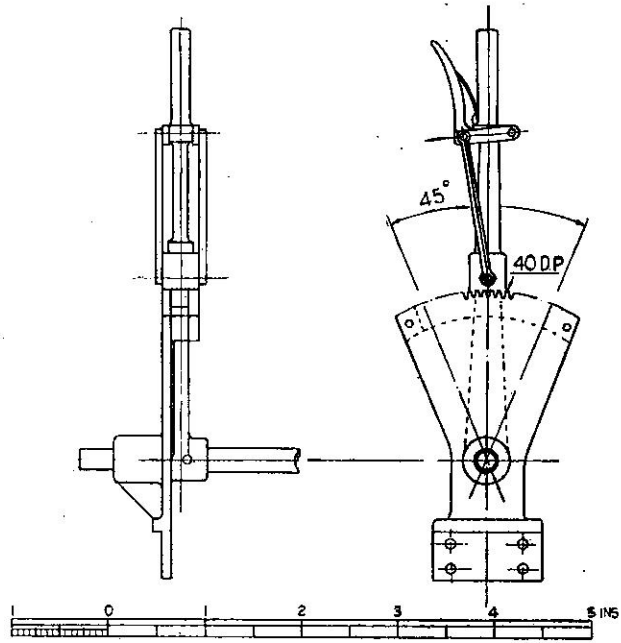
A conference was called, and it was decided to strip Nelson Mk.1, and rebuild the whole job. The frames, bogies and tender undercarriage were O.K. and needed no attention, but that was the rosiest picture that could be painted. Cylinders were bored, new and larger axles were fitted to the driving wheels, a boiler and smokebox were made, twin axle pumps fitted, also an injector and double-cylinder lubricators, all of "L.B.S.C." vintage, and finally a new tank that would hold water in place of the decorative resistance housing that graced the name of tender in the Mk.1.

The conversion to Nelson Mk.2 took 18 months to complete, and I can assure readers that it is extremely doubtful if I shall ever again undertake a rebuild, electric to steam or *vice versa*. When my next STEAM locomotive is built, I hope to escape the chivvying by those in the know who refer to my efforts in confidential undertones: "Now this engine used to run by——," or "This is Fox's Folly," etc. However, despite the friendly banter, to me it will always be the "Triumph of Optimism."

A REVERSING LEVER AND QUADRANT

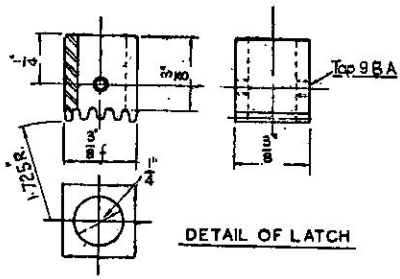
by

K. N. HARRIS



A GOOD many people do not realise the importance of rigidity in the gear controlling a reversible valve-motion. Slackness in pin joints and reversing-lever catches not only causes unpleasant clatter but can quite seriously affect plotted valve events.

The lever catch and quadrant illustrated herewith was designed to eliminate these troubles, as far as possible, and, at the same time, to provide fine adjustment for linking-up. So far as I am concerned the scheme is original, but I am not going to make any claims.



There are two features which are not usual: (1) the making of the actual quadrant as part of a gear wheel; (2) the making of the latch in the form of a bored cylinder surrounding a circular machined part of the reversing-lever. The provision of a number of teeth on the latch which engage simultaneously lessens the stress on the individual teeth of both rack and catch and enables a fine pitch to be used, giving close adjustment of the gear.

The actual specimen illustrated is for a twin-cylinder steam engine with Stephenson gear and marine type "bar" links.

It is about the right size for a 5-in. gauge locomotive, though the quadrant mounting would almost certainly require some modification in design to suit it for this purpose. Provision would have to be made for attaching the reach-rod, too. In the case of the outfit shown, the lever is mounted on a ¼-in. diameter shaft, on each end of which is mounted an arm at 90 degrees to the lever, and to the ends of these arms the lifting-links are directly attached. Such a course, whilst ideal from a rigidity and simplicity point of view, would not be possible with any locomotive of normal design.

The trigger spring is fastened to the base of the handle of the lever and the trigger is grooved on the inside to keep the spring in alignment.

In the actual gear shown, the quadrant teeth were cut on a milling set-up, with a dividing head using a 40 D.P. No. 1 cutter: a complete wheel would have 140 teeth 40 D.P. the *outside* diameter being 3.55 in.—(3½-in. pitch diameter.) Actually, the toothed portion embraces 65 degrees of arc and contains 39 teeth. The latch teeth were cut with a formed slotting-tool held in the toolholder of the lathe slide-rest, which was worked backwards and forwards by the rack gear. The latch itself is mounted on the faceplate at the correct radius and a 70-tooth change-wheel geared two to one to the mandrel (two revs. of the change-wheel to one of the mandrel) used as a divider. The result was a well-fitting latch without a trace of backlash. The whole set-up is rigid and in ordinary use wear should be practically non-existent, so far as the lever latch and quadrant are concerned, over very long periods.

Can you keep a Course?

Some reflections and suggestions on Model Steamer Steering by a waterside spectator

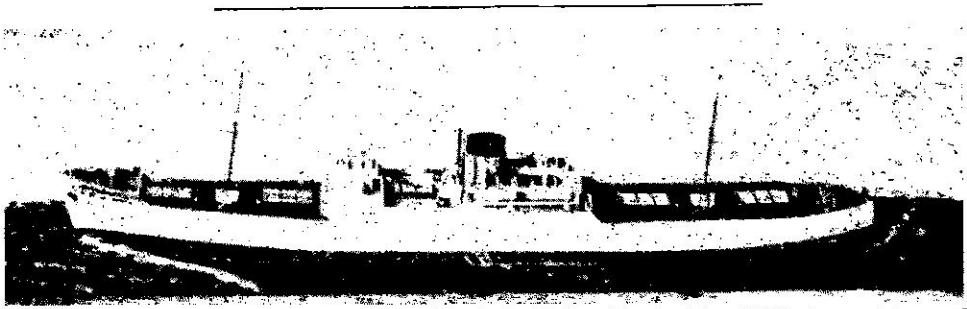
WHY is it apparently so difficult to ensure that a model power-boat will keep a true course? I am not a power-boat owner, but I am frequently an interested spectator of waterside model activities and I have been prompted to ask this question by the sight of boats vainly attempting to get between the buoys at a model steering competition. To be quite frank, and without wishing to cast any reflection on an otherwise most attractive fleet of boats, I was sadly disappointed by the running of the competitors in a recent steering competition held by the West London Model Power Boat Club on the Round Pond.

An assorted fleet of boats was on parade; a nicely modelled battleship, a hefty tug, one or two speedy motor launches, and a rather dumpy cargo-boat of the tanker type were among the contestants. The line of buoys for the target was towed out to position in a very workmanlike, or, shall I say, sailorlike fashion, the starting buoy was fixed, and one by one the competing boats adventured forth. I watched six of them in succession, only one scored a point, and this just managed to scrape inside of the outermost target buoy. The others either consistently headed for the pond side, or, as in one case, took a right-angled turn and proceeded merrily for the open sea. I could not stay for the later runs and possibly what I saw were only preliminary trials for the purposes of experiment. But they did indicate the perversity of the model power-boat in refusing to hold a course, and in this respect conformed to similar instances of misbehaviour I have witnessed in non-competitive running.

What are the reasons for this, and what are possible remedies? I will rule out contributory causes beyond the owner's control, such as a deflecting wind, disturbance of the water by a local current or by the antics of swans or other waterfowl, or the intervention of floating debris, leaves, or twigs, which may have an unexpected effect. If the steering error is a constant factor in the running of the boat, i.e., always to starboard or always to port, the construction of the boat itself will be suspect. Is there a slight deformity somewhere in the lines of the hull, or an unsuspected twist in the bow or stern? Is the power plant somewhere out of balance in its location in the hull? Is the alignment of the propeller-shaft dead true? Is there any inequality in the size or pitch of the blades in the propeller? These are some of the points which might be checked over with advantage.

I am quite aware that target shooting in club competitions is not the primary object in building a power-boat, but anything which adds to the reliability of the normal running of a boat should be worth consideration. Here are some suggestions, possibly rather fantastic to some minds, but not outside the realm of practical experiment for those whose interest in the hobby tends in this direction. Can we, for instance, learn something from model sailing yachts and try the effect of a deep central-fin keel? In big ships, bilge keels are fitted to prevent rolling—why not fin keels, one each side, to aid steering? Is the present rudder of sufficient area to be effective? Why not a fin extension? Or a pair of fins at the stern to resist course deviation? Has anyone tried a rudder at the bow instead of, or additional to, the rudder at the stern? More revolutionary still, has anyone tried fitting the screw forrard instead of aft, making it a tractor instead of a propeller? It works well on 'planes, why not ships? What about a gyroscope housed in the foc's'l head which would sturdily resist any lateral deviation of the bow? The well-known Braine automatic steering-gear, so successfully fitted to model sailing yachts, is, of course, not applicable to power-driven vessels, but why should power-boat men allow their sailing brethren to monopolise ingenuity in overcoming steering problems?

I must pipe down now, lest my "mad-hatter" ideas run away with me, but I have one final suggestion. If anybody needs some serious advice on power-boat target shooting he should consult that popular veteran of the Victoria Model Steamboat Club, Mr. Vanner, who has scored more bull's-eyes than anyone else in contests of this kind, and does it without the tremor of an eye-lid. He knows something!



A fully detailed 1 in. to 25 ft. scale model of the Union Castle Line "R" class refrigerated motor ship, "Rochester Castle," by E. N. Taylor

THE BATTLE OF THE CRANK

Being No. 5 of The Handyman 100 Years Ago

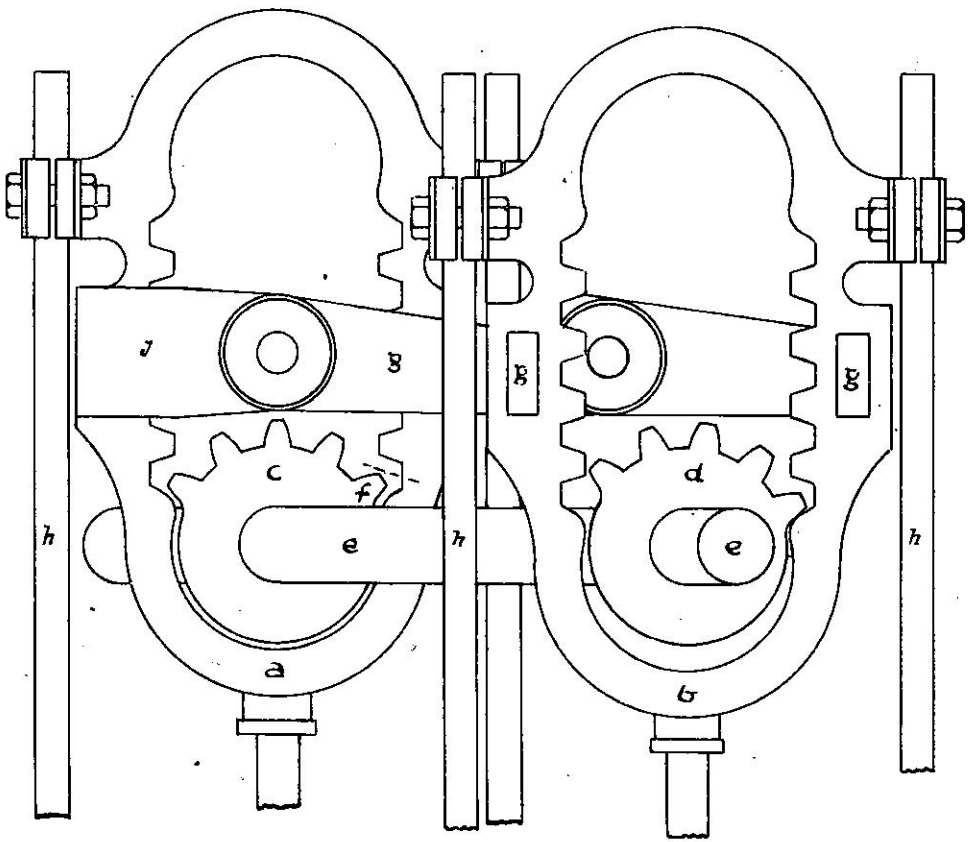
By G. A. GAULD

TO conclude this account of the Battle of the Crank, I will refer to the mechanism patented by F. Lipscombe in February, 1844. The double rack and half pinion type of movement was an old one, and this version was designed to overcome the drawbacks of the original. The complications of the mechanism provide an excellent example of the absurd lengths to which inventive ability was becoming applied when coupled with a complete lack of understanding of the fundamental principles. To quote the inventor himself :—

" Each of the piston-rods, *a* and *b*, is terminated by a rack ; these racks are prevented from swerving by the four guides *h*, and gear intb the open segments *c* and *d*, both of which are keyed to the shaft *e*. The piston rack *a* is seen quite at the end of its stroke, while the piston rack *b* is seen a little way in its downward stroke. It will be observed that the segment *d* is keyed to the shaft with a greater inclination upwards than the segment *c*, thereby effectually preventing both pistons being at the end of a stroke at the same time. Now imagine the shaft to be revolving, and the rack *b* driven against the segment *d*, the other segment *c* having just left one side of the rack gets its tooth *f*, in the other side, before the piston rack can rise sufficiently to prevent its doing so ; but to prevent the possibility of either of the racks overtaking and preventing the segment teeth gearing properly with the racks at the commencement of a stroke, the racks are connected together by two levers *g*, each rack having a projection, *j*, for each lever to take its bearing. One end of each lever is inserted in a slot in one rack, and the other end in a slot in the other rack as shown ; the lever ends are allowed a little play in their upward and downward movement.

" To understand the action of these levers, it will be necessary to imagine the engine at rest.

Concluded from page 544, " *M.E.*," *Vol.* 94, *May* 30, 1946.



If steam is admitted in that cylinder only which contains the piston of the rack *a*, this rack will rise so as to bring its tooth into the dotted position just below the segment tooth *f*. The play allowed at the ends of the levers will permit it to rise thus far but no farther, unless it likewise raises the other rack, by doing which it turns the shaft and both segments ; the tooth *f* then slips inside the rack, without a possibility of the rack preventing it. There is this peculiarity observed in a rack working into a spur-segment, the more fairly a tooth of a segment is in a rack, the less is the amount of play between that tooth and the teeth of a rack, so that, although there is comparatively a great deal of play between the outer teeth of a segment and the rack teeth at the commencement of a stroke, that amount of play decreases very much at the instant a segment inclines from one side of a rack to the other. This decrease of play has the effect of discontinuing the action of the levers immediately each segment has a tooth fairly in the side of a rack ; thus when the segment tooth *f* is as fairly in its rack as is the corresponding tooth of the other segment in the rack *b*, the action of the levers will have discontinued."

The inventor then points out that as there is little effort at the commencement of the piston stroke, the racks will enter the segment teeth without shock, and adds, as if to avoid further criticism : " at all events, a suitable arrangement of the slide valves could accomplish this." Bearing in mind that he has already pointed out that the average effort of the crank is but half the maximum available pressure combined with further inefficiencies due to the angularity of the connecting-rod, it is not altogether surprising to read the remarkable claims he makes for his invention :—

" By using this substitute instead of a crank, the saving may be safely stated as more than three-fourths the first cost, the weight of an engine three-fourths less, occupying less than one-fourth the space, and consuming less than one-third the quantity of fuel."

Pretty staggering, even for an inventor !

FOOTNOTE :—*The sketch and text are reproduced exactly as in the original, but it would appear that the sketch should be printed the other way up. Assuming that it is to be used with a beam engine, the racks would, of course, be suspended and it would appear that the inventor had this in mind when writing his description.*

Clubs

The Society of Model and Experimental Engineers

The last meeting before the Summer recess will be held at 39, Victoria Street, Westminster, S.W.1 on Saturday, July 13th, at 2.30 p.m. The talk on this accasion will be given by Mr. Edgar T. Westbury upon the subject of Rotary valves applied to model internal combustion engines.

The fixture list for the second half of the year is now being completed and members will receive copies of this in good time.

The new issue of the " Journal " should now be in the hands of all members. They will note therein a form to be completed by all who can assist the forthcoming MODEL ENGINEER Exhibition by offering their services as Stewards or by the loan of models. The Council appeal to all who can help in this way to complete and send in these forms at once. Please remember that the success of the Exhibition depends upon a good showing of models and adequate manning.

Secretary : J. J. PACEY, 69, Chandos Avenue, Whetstone, N.20.

York City and District Society of Model Engineers

Next meeting, July 6th, 1946, in No. 11 Room, Co-operative Hall, Railway Street, at 7 p.m. sharp.

Hon. Secretary : WM. SHEARMAN, 28, Terry Street, York.

Glasgow Society of Model Engineers

The society has removed to new rooms at 60, Clarendon Street, Glasgow, N.W., five minutes from St. George's Cross Underground Station. The usual Saturday evening opening will be observed until establishment allows for the reinstatement of pre-war opening arrangements. Meantime any willing to assist in the considerable rehabilitation scheme now in progress should advise the Secretary, so that the best use can be made of the generous offers so far received. There will be no official meetings in July or August, but opportunity will be taken of the respite to establish the new headquarters. It is hoped to publish the usual " Bulletin " in September, in which month, also, an effort is being made to open the 840 foot continuous railway site at Rutherglen. Here again, those interested in locomotive matters are invited to assist. The work is now approaching an attractive stage, namely, preparation for rail laying.

Visitors will be welcomed and particulars of membership can be had from the address below.

Secretary : JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

Welling and District Model Engineering Society

At the special general meeting of the Welling Society Mr. W. Dixon was appointed Secretary in place of Mr. E. Dixon, who had resigned for personal reasons. The meeting also elected Mr. A. C. Clark as Chairman in place of Mr. Perrin, who had resigned the office owing to his business taking him away from London. The Club also appointed Mr. J. King, 150, Sutherland Road, Welling, as Track Secretary, to take charge of all arrangements for the Club's new track, which is now complete. The meeting decided to hold club nights on alternate Fridays only for the moment. July meetings will be Friday, July 5th and 19th, when visitors will be welcome. Intending members and all others interested should communicate with the Secretary, Mr. W. King, 81, Brixham Road, Welling.

The Bolton and District Society of Model Engineers

The next meeting will be held on Tuesday, July 9th at the Y.M.C.A., Deansgate, Bolton, and final arrangements will be made for the Exhibition which will be open July 27th, 2-10 p.m., July 29th to August 2nd, 6-10 p.m., and August 3rd, 2-10 p.m.

There will be an open competition with three prizes and a competition for club members only. Any further particulars either of the competitions or of the Exhibition can be obtained from the Exhibition Manager, Mr. J. Denton, 29, 5th Avenue, Bolton.

The Kent Model Engineering Society

On Sunday, June 2nd, the Society held a very successful track run and display of models at the headquarters. About 160 ft. of track was erected and two new passenger trolleys were put into service.

Mr. V. Wattingham's 5-in. gauge "Pacific," Mr. A. Wattingham's 3½-in. gauge "Atlantic" and Mr. Kelman's 5-in. gauge "Eva May" were in steam and hauling heavy loads.

In the Club Room a representative display of models was on view, including locomotives, boats, a traction engine, and a racing car. Major Binyon had on view the apparatus he uses in connection with his experiments on accelerated motion cinematography.

Major Binyon demonstrated this apparatus to an interested audience and projected a 16-mm. film taken with the aid of this apparatus, the film showing the movements which take place in flowers whilst growing.

The members then partook of an excellent tea that had been prepared by the ladies. In the evening, a film show was given by Mr. Bernardes. A very interesting colour-film taken in Switzerland was shown, also various other films showing several of the Society's track runs and power-boat meetings.

The Society's thanks are due to the members and their wives and friends who helped to make the meeting a success, and it is hoped to hold a similar function in the not too distant future.

For the Society's regular weekly meetings the following fixtures have been arranged :—

July 8th—Discussion on Workshop Equipment.

July 15th—16-mm. film : "Building a L.M.S. 'Princess Royal' class Locomotive."

July 22nd—Rummage Sale.

In addition to the track runs already booked, the Society will be operating the miniature railway at Messrs. Elliott Bros. Sports Day, Avery Hill Road, New Eltham, on July 6th.

Hon. Secretary : A. BROCK, 342, Green Lane, New Eltham, S.E.9

Billericay Society of Model Makers

A further effort is being made to start the above Society. To attract attention a shop window exhibition of models was recently held in the High Street, Billericay.

An inaugural meeting was held on July 2nd at the Women's Institute, Billericay, at 7.30 p.m.

Mr. F. H. COX has been appointed Secretary *pro tem.*, and enquiries should be sent to him at "Woodside," Perry Street, Billericay.

Proposed Ashford (Kent) Club

The formation of a model engineering club in Ashford, Kent, is being contemplated. Any reader interested in this idea is invited to communicate with Rev. D. T. SCOTLAND, 31, Albert Road, Ashford, Kent.

Dorking Model Engineering Club

Although it has been formed only some three months, the Dorking Model Engineering Club has already attracted about 70 members, and a three-day exhibition of model work, held at the Dorking Halls on May 23rd, 24th and 25th, proved a great success. More than 5,000 people paid for admission during the three days' opening, and the passenger-carrying track, on which two 3½-in. gauge steam locomotives were worked, was patronised by over 1,700 children. The exhibits included steam locomotives, complete and under construction, and steam, electric and clockwork railway layouts, stationary engines, machine tools, aircraft, buildings, and handicrafts. The handicraft section of the Club enrolled fifty members during the course of the exhibition.

Many of the models were of a really high standard of workmanship, and the task of judging the most suitable for the award of the silver cup, kindly presented by the Club's President, Mr. A. K. Kirk, J.P., was by no means an easy one. The selection for this honour of Mr. W. J. Poole's 3½-in gauge "Maisie" Atlantic locomotive, was well merited, and was all the more applauded for the untiring efforts which Mr. Poole himself has made to foster the cause of model engineering in this district, including the shouldering of the onerous duties of Secretary to the Club. The second prize was awarded to Mr. P. F. Rush for a group of three stationary engines, the third to Mr. S. E. Warrow for a miniature coil-winding machine, and the fourth to Mr. S. D. Ogilvie for his sailing dinghy.

The Southern Railway, through the courtesy of the General Manager, Sir Eustace Missenden, kindly loaned glass-case models of steamships and also provided a number of films. The Malden Society gave much support with the loan of model locomotives and the passenger-carrying track. The Club holds its meetings on the second Thursday in the month at Pippbrook, Dorking, and all interested in model work in the district are cordially invited to attend. The Secretary is Mr. W. J. POOLE, "Wyncet," St. Paul's Road, Dorking.

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The Editor invites correspondence and original contributions on all small power engineering and electrical subjects, which should be addressed to him at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall and Co. Ltd., 23, Great Queen Street, London, W.C.2.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.

"THE MODEL ENGINEER"
SALES AND WANTS

Private: **Threepence** *word.* *Trade*: **Sixpence** *word.* *Use of Box* **2/6** *extra.*
Minimum charge, **3/-**.

TOOLS & WORKSHOP

Buck and Ryan's Department for Lathes, Drilling Machines, Grinders, Electric Tools, Chucks, Surface Plates, Lathe Accessories and Tools.—310-312, Euston Road, London, N.W.1. Telephone: EUSton 4661. Hours of Business: 8.30 to 5.0 p.m., Monday to Friday; Saturday, 1.0 p.m.

Split Chucks for Watchmakers' Lathes, 6 mm., 6½ mm., and 8 mm., at 7s. each, postage 6d.—JOHN MORRIS, 64, Clerkenwell Road, London, E.C.1.

"Tool News" keeps you up-to-date. Specimen copy 6d., post free.—GARNERS, Sheffield Road, Barnsley.

Wood Workers. Send S.A.E. for details of our new W.T. Lathe.—GARNERS, Sheffield Road, Barnsley.

Brass Sheet. Available any size ex stock delivery.—ALEXANDER PRODUCTS, Blue Bell, Shiremoor. Tel. 292.

Corbett's (Lathes), Stanton Hill, Mansfield. Offer:—Ball-bearing Treadle Grinders, price 70s.; new Lathes and Bench Milling Machines, Sets of "Wimet" Tipped Lathe Tools, eight standard shapes, price £3 12s.; Brass rounds and hexagons, ¼" to 1", Crown 4" self-centring Chucks, £3 12s. 6d.; 6" Independent, £3 5s. Cash or C.O.D. Telephone 583, Sutton-in-Ashfield.

Bench Lathes, Bench Millers, Pedestal Drills, Myford Spares, Lathe Tools, Milling Cutters, Slitting Saws, Chucks, Micrometers, small Tools for delivery from stock.—F. W. KUBACH, 12, Sylvan Road, Upper Norwood, London, S.E.19.

Genuine American 5" Atlas Motorised Bench Lathe, 24" between centres, 16 speeds from 28 to 2,000. Taper roller-bearing headstock, power cross-feed, cuts 4 to 96 threads per inch. Threading dial indicator, 1¼" mandrel nose, 9½" saddle ways, and 5" wide bed, Vee belt drive, innumerable attachments can be obtained for this lathe, including draw in collets, milling attachments, etc. First £55 secures.—WALTERS, 356, High Street, Ponders End, Enfield, Middx. How 1648 between 9 and 6.

Lathe, 4½" Centres, Precision Coned Bearings, £30.—38, Mayfield, Wembley. Arnold, 3734.

New 8 mm. Collet Chucks, 6s. each, various sizes.—11, Malcolm Grove, Thornaby-on-Tees, Yorks.

Wanted, Round Bed for 4" Drummond Lathe. For sale, 100 v. 4½ a. shunt wound dynamo.—7, Castleton Road, Royton, Lancs.

For Sale, Myford 3½" × 24" Lathe, two chucks, faceplate, set over tailstock, extra gears, wired for 3-phase motor on stand, in good condition. What offers.—D. B. FORTUNE, Hornflowa Ltd., Maryport.

Wanted, Back Gear Attachment for 4" Drummond Lathe.—WEBSTER, 19, Altmore Avenue, London, E.6.

5" Atlas Lathe, excellent condition, chucks, turret, etc., 2B Flypress, 8" Grinding Polishing Head with wheels and mops, ¼" capacity power bench drill, ¼ h.p. A.C. Motor. The lot £90.—PENN, 54, Eccleston Crescent, Romford. 'Phone Seven Kings 6308.

2" Centre Bench Precision Screwcutting Lathe, complete, 12" between centres, equipped with 3" S.C. chuck, faceplate, and 1 set of collets with draw-in bar (hollow mandrel), almost new condition, for sale at—282, Kingsland Road, London, E.8.

Wanted, Compressor, suitable Paint Spray requiring 40 lb. pressure.—JEFFERIS, Cleveland, Kinnerley, Salop.

Fly Presses, Arbor Presses, Guillotines, second-hand. Lists free.—VICTA ENGINEERING COMPANY, Maidenhead, Berks.

Wanted, 3½"-4" B.G.S.C. Lathe, in good condition. Particulars to—A. JONES, Pantyrochain, Gresford, Wrexham.

Lathes. Build your own Toy or Model Maker's Lathe easily from readily obtainable parts only (costing about 50s.) No castings or machining needed. Set of clear diagrams and instructions for making all parts, including alternative types of headstock, chuck, etc. Price 3s. 6d.—M. BARHAM, Les Buttes, Torteval, Guernsey, C.I.

Sale, No. 3 Jacobs Drill Chuck (0 to ½") with key, new condition, 30s.—28, Beverley Street, Derby.

Southbend 4½" Precision Toolroom Lathe, motorised, on stand, S.C.B.G., power longitudinal feed, power cross feed, complete range equipment, £80.—HILL, 62, Leigham Vale, Streatham, London.

Wanted, Lathe, about 3", screwcutting, or otherwise.—POPE, 9, Meadow Avenue, Seaton.

Several Small Compressors, about 1¾" bore and stroke, in new condition, £4 10s. each, on approval against cash. 'Phone Gerrard's Cross 3567.—QUINTON, 358, Lansbury Drive, Hayes, Middx.

Wanted, Lathe up to 4", with accessories if possible.—NEEDHAM, 34, Maple Avenue, Upminster, Essex.

Small Horizontal Miller, Table 15" × 5", M.T. No. 2, mounted on stand, complete with 3-speed Vee belt drive and countershaft, little used, £20; parts of Screwcutting Lathe, including bed, 48" × 5½", compound slide-rest, complete tailstock, rack, and parts of headstock, £4; Plain Lathe for wood turning, machined box bed, complete with faceplate, band-rest, etc., as new, £8. Wanted, small dial indicator, milling cutters to 6", and end mills to 3" diameter.—STEPHENSON, 167, Woodcote Road, Reading. 'Phone 72616.

5½" Centre B.G. Treadle Lathe, 4" 6" gap and swing, 22" bed, S.C. chuck, 9" faceplate, 2 Bell chucks, compound slide-rest, excellent condition, £25. Write—A. BARBER, 17, Cressy Road, N.W.3.

Drummond Foot Motor for Sale, flat belt, £3 10s.—IRWIN, 48, Hartland Way, Shirley, Croydon. Tel. Springpark 3292.

Lathe, Drummond 3½", with extra long bed, stand, and accessories to total value of over £71. Accept £48.—SMURTHWAITE, Ross Parade, Wallington, Surrey.

2½" "Portass" Lathe, 9" between centres, complete with foot motor, chucks, slide-rest, tools, and other accessories. Offers.—G. THOMPSON, 83, Christleton Road, Chester.

Wanted, Myford 3½" or 4" B.G.S.C. Lathe, with chucks, etc. Details to—GREENSIDE, Morthen Road, Thurcroft, Rotherham.

MODELS & FITTINGS

Wanted, Tank Engine, Castings, or preferably partly finished half or three-quarters, blueprint.—LAWTON, "Oriel," Ecton Avenue, Macclesfield.

Australian Designs, Engines, Locomotives, catalogues, 2s.—BOLTON, 70, King Street, Sydney.

David Curwen, Experimental Engineers, Gore Lane, Bardon, Nr. Marlborough, Wilts. Light power steam engines of all types.

Apex and New Atom Minor (Mr. Westbury's design). Engine castings of DTD 424, the famous alloy as used in Rolls Royce Aero engines, Sp. gr. 2.56. Tensile 9 tons, lighter and far stronger than die cast, with most attractive finish. Carburettor castings (described June 14th issue "M.E."), and spiral timing gears for Apex; Ball-races, piston rings, miniature plugs, contacts and other equipment. Send us your enquiries. Trade also invited.—THE HEADINGLEY MOTOR & ENGINEERING CO. LTD., 8, Otley Road, Leeds.

2½" Gauge 0-6-0 Coal-fired Passenger Hauler, fluted Walschaerts gear, mechanical lubrication, axle, tender and duplex donkey pumps, high-class workmanship throughout, £50; castings for 7¼" gauge 4-6-0 Sandringham, £12; set castings, drawings and finished frames for 3½" gauge G.W.R. 2-6-2 tank, £4 10s.; castings, materials and drawings for 3½" gauge L.M.S. Royal Scot, Princess Royal, G.W.R. King, L.N.E.R. Green Arrow, S.R. Schools, Lord Nelson, gauge "O" locomotive wheel castings. S.A.E.—Box No. 4022, MODEL ENGINEER Offices.

Majesco "45" Miniature Aero-Motor (4.5 c.c.), die castings; all materials; detailed instructions; working drawings. Complete kit, 36s. (post paid).—MAJESCO MINIATURE MOTORS, 35, St. Flora's Road, Littlehampton, Sussex.

6 V. Electric Crane, £3; 3" Pelton Wheel, 15s.; ⅝" × ⅝" Engine, 25s.; Twin ⅝" × 1¼" gunmetal cylinders, crankshaft and rods, £5; boiler fittings. S.A.E.—26D, Redcliffe Square, S.W.10.

2½" "Hudson" P.V. cylinders combustion chamber; Boiler "Schools" 3 cylinders chassis; 2-6-0 G.W.R. chassis; 2-8-0 G.W.R. Steph. link; "Fayette" Boiler; inside cylinder for "Olympiad"; 3½" "Marina" chassis; ball-bearings, 2½" castings, cylinders, horns, pumps, injectors, wheels, etc.—A., 13, Treaford Lane, Ward End, Birmingham 8. Tel. East 0688.

Boiler, Cornish type, steel, 13" diameter × 30" long, mahogany lagged brass bands. All fittings, except water-gauge, including injector, £8. Buyer arranges collection.—Box No. 4043, MODEL ENGINEER Offices.

Wanted, 5" Gauge Passenger Hauling Locomotive. Must be in first class condition. Particulars and price to—33, Woodlands Avenue, West Byfleet, Surey.

New Hornby 20 V. "Princess Elizabeth." Best offer.—Box No. 4044, MODEL ENGINEER Offices.

Summerscales, 18, Highbury Grove, Cosham, Hants. Send S.A.E. for interesting news. "L.B.S.C." Locomotives and 1½" scale Road Locomotive.

Mechanical Lubricator, 35s.; 3/16" Check Valve, 6s. 6d.; 3/16" Water Gauge, 7s.—THOS. MCCRACKEN, 388, Main Street, Rutherglen.

Vertical High Speed Engine, ⅝" bore × ⅝" stroke. Fitted feed pump and reduction gear, displacement lubricator, complete with silver-soldered boiler and paraffin blowlamp, condition as new, £14, or nearest offer.—Box No. 4045, MODEL ENGINEER Offices.

For Sale, Bargain, Complete set of partly-machined parts for 2.5 c.c. Petrol Engine, 18s. 6d.—TEAL, 2, Green Road, Kidlington, Oxon.

Wanted, Drawings and any parts of 7¼" gauge, 1¼" scale S.R. "Schools" class locomotive. Would consider one partly built.—MILLER, "Ravensprings," Brighouse, Yorks.

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Stewart 1 H.P. (Petrol) water-cooled stationary engine (governed), overhauled, seen running, £15.—72, Hawthorne Grove, Penge.

Sale, Owner going Abroad, Two vertical single cylinder Steam Engines, in bronze, 2" × 13/16", one in iron; one horizontal, ½" × ⅜", all engineer built, as new, £2 each.—GIBBARD, Four Oaks, Meriden.

Marine Engine Castings, ½" B. & S. Slide valve, D.A. Best bronze, with crankshaft forging and fully detailed drawings and instructions. Very pretty and efficient 4 column design. The real thing in miniature. "Beautiful engine" says user, 25s.; finished crankshaft, cylinder bored, 5s.—"MARINE," 80, Ridgeview Road, London, N.20.

For Sale, 2½" Gauge Locomotive, by Jubb, Sheffield, 4-6-4, 2 Pullman Coaches, 60 ft. Track.—MANN, 20, Crecy Road, Coventry.

Wheels for 5", 3½" Gauge "Royal Scot," L.N.E. Pacific, "Hielan' Lassie," "P.V. Baker," etc., Horns, 3½", 5" gauge, cylinders, slide and piston valve, special treated frame steel. S.A.E.—VINCENT BYRNE, 2, Church Street, Middlesbrough.

Sale, Quantity of Steam Fittings, T Pieces, Safety Valves, Hand Rail, Knobs, etc., 40s.; M. and W. Micrometer 961S, with metal case, 30s.—44, Sandringham Avenue, Leicester.

7½" Midge Wheels, 25s. set; other parts at pre-war price; 7½" "Royal Scott" wheels and parts, cheap.—SCOTT, 32, Thornbridge Drive, Frecheville, Sheffield.

Pressure Gauges, ¾ × 100 lb. (Bassett-Lowke), will exchange, with cash difference, for 1" × 100 lb. gauges in good accurate condition.—G. B., Higher Hannaford, Landkey, N. Devon.

West Riding Readers. Everything you require obtainable at—MODEL ENGINEERING CENTRE, 46-48, Wade Lane, Leeds. Tel. 23423.

2" Gauge Clockwork Tank Locomotive, 11 tinplate trucks, about 40 feet 3-rail track, £10; also 8 wooden trucks, signal parts and accessories, £6. S.A.E. for full details.—COOPER, 64, Heath Road, Petersfield, Hants.

Sets of Boiler Materials. All plates cut to shape and size. Ready for flanging for "Ada" 2-8-0 and 2-10-0 "Petrolea," "Molly," "P.V. Baker," "Dyak," "Ten to Eight," "Bantam Cock," "Maisie," and "Rainhill." All tubes and rivets, etc. Other boilers quoted for on receipt of cutting lists or drawing. S.A.E. with all enquiries.—LINSTEAD, 69, Alexandra Road, Wimbledon, S.W.19.

For Sale, 3½" gauge "Maisie," G.N. Atlantic, coal-fired, G.N. colours, two flat cars, and set of MODEL ENGINEERS, £90, or near offer.—CROOK, 7, Burgh Wood, Banstead, Surrey.

1" Scale Coal-fired Locomotive 4-4-2 "Maisie" type, seen in steam, price £35.—Box No. 4055, MODEL ENGINEER Offices.

2½" Gauge Dyak Chassis, less cylinders (photograph), £8 8s.; 120 volt Voltmeter, D.C., old volumes MODEL ENGINEER and "Railway Magazine." Tel. Speedwell 6354.—WHITE, 21, Meadway Court, Hampstead Garden Suburb, N.W.11.

Locomotive Cylinder Castings bore to 1½", steam chests, covers, eccentrics, buffers, hornblocks. All gunmetal. "Hielan' Lassie" steel frames, slots and gaps cut. Spot drilled if required. Flywheel castings, 2⅜" × 7/16", gunmetal. S.A.E. please.—KENDALL, 106, Rugby Road, Binley, Coventry.

New De Luxe Model 3-Seater Foldboat Folding Canoe, with special additional strengthening skin complete, with carrying bag, £32 10s.—TEDDINGTON ENGINEERING CO., 29, High Street, Teddington, Middx. 'Phone KIN. 1193.

Wanted, Dynamo No. 2 Bottone, or similar; also Boiler for Stuart-Turner Horizontal Engine, 1½" × 1½". Particulars, price.—BROWN, 87, Bedford Road, Southport.

ELECTRICAL EQUIPMENT

Electradix Bargains include:—

Dynamo and Motor Generator Bargains. G.E.C. double current Dynamos, 6 volts, 5 amps., 600 volts, 80 m.a., ball-bearings, 17 lb., as new, 37s. 6d., carriage paid, 5s. refunded on returned packing case.—Below.

Small D.C./D.C. Motor Generators by leading makers for use in Radio Receivers to take the place of H.T. battery, 6 volts input, 110 volts, 15 m.a. output, or 12 volts input, 230 volts, 30 m.a. output, £3 15s., weight only 5½ lb., size 5½" × 3½" × 3½", model finish, ball bearings, 2-comms., 2 separate windings, waterproofed.—Below.

Transformers, 3 K.W. Crypto, 230 volts to 115 volts, 28 amps., £9 10s.; to small Bell Transformers, 230/3/58 volts, 7s. 6d. Transformers for Rewind, 3 K.W. with stampings, 4½" × 6" × 7½", windings damaged by blitz, weight with damaged wire, 65 lb., 45s., carriage extra.—ELECTRADIX, 214, Queenstown Road, London, S.W.8.

D.C. Motors, ¼ h.p., 200/250 volts, £6 18s. each; ⅛ h.p., £3 15s. each. Many others.—JOHNSON ENGINEERING, 319, Kennington Road, S.E.11. RELiance 1412/3.

Best Bargain Yet! Large number of brand new Rotax Dynomotors, 24 v., delivering 95 v., with high amps. Will work on 12 and 6 v. Could possibly be made into welding plant, or as a motor for driving machinery, very powerful. Cost Gov. originally £30, now at a gift £1 5s. each, including carriage.—EMMS, 68, "Redcliffe," Old Brompton Road, S.W.5. Flaxman 3634.

"Pigmy" Electric Motors for Boats, fans, etc., 2¼" × 2" × 1⅜", 10 ozs., A.C./D.C. 4/24 volts, flashlamp batteries, accumulators, transformer, send 25s. 7d. EDUCATIONAL MANUFACTURING COMPANY, 197, Brownshill Green Road, Coventry.

A.C. Induction Motor, 1 h.p., 200 V., 50 cycles, single phase, no starter, £5.—C. R. STARNES, 107, Roseberry Gardens, Harringay, N.4.

Lister Diesel 7½ Kilo. Watt Vertical Lighting Plant, in new condition, £150.—VICTA ENGINEERING COMPANY, Maidenhead. Tel. 50.

For Sale, Rotary Transformer, 12 volts D.C. to 475 volts 200 m.a. D.C., new and in excellent condition, ball-bearings and double commutator. Suitable for portable transmitter or P.A. equipment, £4 10s.—ALEXANDER, 27, Heath Drive, Gidea Park, Essex.

New H.T. Eliminator (200/250 V. A.C.), output 60/90/120 V., 15 m.a., 55s.—JOLIFFE, Aston Clinton, Bucks.

GENERAL

Watch and Clock Making. If interested you can get all tools and parts, also wheels cut from—JOHN MORRIS, 64, Clerkenwell Road, E.C.1. Regret no posts or lists, only counter service at present.

Watchmakers Demobbed need Lathes to start work again. John Morris (Clerkenwell) Ltd., will pay high prices for Lathes by Lorch, Boley, Wolf Jahn, and American and Swiss makes.—64, Clerkenwell Road, E.C.1. CLE 6077.

Detail Drawings, Assemblies, Tracings. Efficiently drawn up from sketches and notes.—DIMMOCK, 25, Chilworth Street, W.2.

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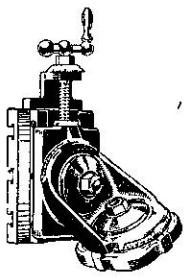

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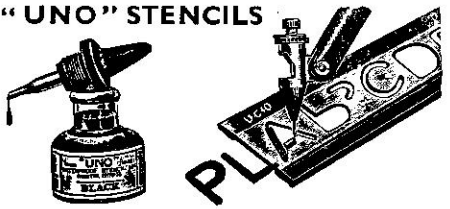

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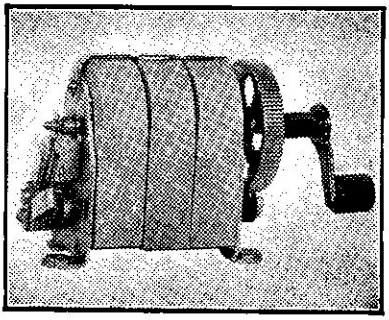
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